COMENIUS UNIVERSITY, BRATISLAVA
FACULTY OF MATHEMATICS, PHYSICS AND INFORMATICS

CGE MODELLING OF POTENTAL MACROECONOMIC EFFECTS OF EMPLOYING SOCIALLY EXCLUDED GROUPS

DISSERTATION THESIS

2022 **Mgr. Richard PRIESOL**

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DISSERTATION THESIS

Study Programme:	Applied Mathematics
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Supervisor:	h.doc. RNDr. Viliam Páleník PhD.

Bratislava 2022 **Mgr. Richard PRIESOL**

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THESIS ASSIGNMENT

Name and Surname:	Mgr. Richard Priesol
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Title: CGE modelling of potential macroeconomic effects of employing socially excluded groups

Annotation: Extremely high long term unemployment decreases the potential product of Slovakia. A decrease in long term unemployment connected to an increase in employment would lead to the inclusion of significant groups of inhabitants into society's functioning and production. This is in accordance with the Europe 2020 strategy. Risks connected to this strategy are its sustainability and costs, its opportunities are demographic changes in the society. The thesis will use CGE modelling with a special SAM matrix. The goals of simulation scenarios are the estimation of a potential product loss and the estimation of costs of ending the social trap. The thesis will continue on the works done in the APVV project Inclusive growth in the Europe 2020 strategy – naivety or geniality? and it will be a part of a current APVV project Social trap - costs and the way out.

Aim: The goal of the thesis is to estimate a potential product loss of the Slovak Republic due to long term unemployment with a focus on socially excluded communities and an impact of social investments that could lead to a significant decrease of this loss.

Tutor:	doc. RNDr. Viliam Páleník, PhD. (from 2020-03-25)
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ZADANIE ZÁVEREČNEJ PRÁCE

Meno a priezvisko študenta: Mgr. Richard Priesol
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Názov: CGE modelling of potential macroeconomic effects of employing socially excluded groups
Výskum potenciálnych národohospodárskych efektov zamestnania sociálne vylúčených komunít CGE modelovaním

Anotácia: Veľmi vysoká dlhodobá nezamestnanosť dlhodobo znižuje potenciálny produkt Slovenska. Jej zníženie spojenej s nárastom zamestnanosti by viedlo k zapojeniu významných skupín obyvateľstva do chodu spoločnosti a tvorby pridanej hodnoty. Toto zodpovedá inkluzívnemu rastu stratégie Európa 2020. Rizikami takejto stratégie je jej udržateľnosť, nákladovosť, ale šancou je starnutie populácie. Pri práci bude aplikovaný CGE model s na to zostavenou SAM maticou. Cieľom simulačných scenárov bude odhadnutie straty potenciálneho produktu a nákladov na vymanenie zo sociálnej pasce. Práca bude nadväzovať na ukončený projekt APVV Inkluzívny rast v stratégii Európa 2020 – naivita lebo genialita? a priamo bude súvisieť a prebiehajúcim projektom APVV Sociálna pasca - náklady a cesta von.

Cieľ: Cieľom práce je odhadnúť stratu outputu SR kvôli dlhodobej nezamestanosti s dôrazom na sociálne vylúčené komunity a vplyv spoločenských investícií, ktoré môžu viesť k signifikantnému zníženiu tejto straty.

Školiteľ: doc. RNDr. Viliam Páleník, PhD. (od 25.03.2020)
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Dátum schválenia: 07.06.2017

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Abstract

PRIESOL, Richard: CGE modelling of potential macroeconomic effects of employing socially excluded groups [Dissertation thesis], Comenius University in Bratislava, Faculty of Mathematics, Physics and Informatics, Department of Applied Mathematics and Statistics, Supervisor: h.doc. RNDr. Viliam Páleník PhD., Bratislava, 2022, 98 p.

In this thesis, we construct a computable general equilibrium model of the Slovak economy to evaluate an impact of different types of active labour market policies on an economic performance, with a focus on the activation works and the inclusive programmes. We then apply individual microeconomic data to identify socially excluded communities and place them either in the activation works or the inclusive programmes in each simulation period. We further distinguish between two forms of the inclusive labour market that operates on a basis of inclusive employers or social enterprises. While the first ones operate as standard producers with additional subventions from government, the latter ones are explicitly designed for the employment of socially excluded communities. Our results show that both types of active labour market policies help to reduce structural unemployment and improve potential production in the Slovak economy. However, we find out that the inclusive programmes provide much better results than the activation works in a medium horizon. Furthermore, while the application of the inclusive employers leads to a better improvement of potential production, in line with a higher productivity of production factors, the application of the social enterprises leads to a more significant reduction in structural unemployment, due to an absence of social dumping on the domestic labour market.

Keywords: Social exclusion, Structural unemployment, Activation works, Inclusive programmes, Computable general equilibrium model

Abstrakt

PRIESOL, Richard: Výskum potenciálnych národohospodárskych efektov zamestnania sociálne vylúčených komunít CGE modelovaním [Dizertačná práca], Univerzita Komenského v Bratislave, Fakulta matematiky, fyziky a informatiky, Katedra aplikovanej matematiky a štatistiky, Školiteľ: h.doc. RNDr. Viliam Páleník PhD., Bratislava, 2022, 98 s.

V tejto práci vytvoríme model všeobecne vypočítateľnej rovnováhy slovenskej ekonomiky na vyhodnotenie vplyvu rôznych typov aktívnych politík trhu práce na ekonomickú výkonnosť, so zameraním na aktivačné práce a inkluzívne programy. Následne využijeme individuálne mikroekonomické dáta na identifikovanie sociálne vylúčených komunít a v každej simulačnej perióde ich umiestnime buď do aktivačných prác alebo do inkluzívnych programov. Ďalej budeme rozlišovať medzi dvoma typmi inkluzívneho trhu práce, ktorý funguje buď na princípe inkluzívnych zamestnávateľov alebo sociálnych podnikov. Zatiaľ čo v prvom prípade hovoríme o štandardných producentoch podporovaných vládnymi dotáciami, tak v druhom prípade hovoríme o špeciálnych podnikoch navrhnutých na zamestnávanie sociálne vylúčených komunít. Naše výsledky ukazujú, že obidva typy aktívnych politík trhu práce pomôžu znížiť štrukturálnu nezamestnanosť a vylepšiť potenciálnu produkciu v slovenskej ekonomike. Zistili sme však, že zo strednodobého hľadiska prinášajú inkluzívne programy omnoho lepšie výsledky ako aktivačné práce. Okrem toho, zatiaľ čo využitie inkluzívnych zamestnávateľov vedie k vyššiemu nárastu potenciálnej produkcie, vzhľadom na vyššiu produktivitu výrobných faktorov, využitie sociálnych podnikov dokáže výraznejšie znížiť štrukturálnu nezamestnanosť, vzhľadom na absenciu sociálneho dampingu na domácom trhu práce.

Kľúčové slová: Sociálne vylúčenie, Štrukturálna nezamestnanosť, Aktivačné práce, Inkluzívne programy, Model všeobecne vypočítateľnej rovnováhy

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Poďakovanie

Chcel by som sa poďakovať svojmu školiteľovi h.doc. RNDr. Viliamovi Páleníkovi PhD. za jeho čas a poradenstvo počas písania tejto práce. Takisto by som sa chcel poďakovať doc. Ing. Danielovi Dujavovi PhD. za užitočné postrehy a komentáre.

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1 Introduction

Social exclusion of minorities presents a serious problem for world economies from both social and economic point of view. Structural differences in living standards and social relations with a respect to the major population could lead to a formation of generational poverty and a direct or latent discrimination of the excluded communities. Furthermore, an absence of necessary education and working habits results in a formation of structural unemployment with a negative impact on potential production. Finally, poor living standards and generational poverty of the excluded communities create an additional pressure on a public sector in a form of extensive expenditures on social transfers.

There is a number of examples across the world about negative implications of social exclusion of minorities. In this thesis, we analyse the case of the Slovak Republic that is characterized by a structural segregation of a part of the Roma community.[1] We reason that this segregation has resulted in a high degree of poverty within the community that is observable across generations, catastrophic living standards in particular country areas, a high degree of dependence on social transfers and a formation of structural unemployment that is driven by an absence of necessary education and working habits. The unfortunate combination of these factors then makes it extremely difficult to break the loop of social exclusion and thus improve the current situation of the Roma community. Furthermore, the problem is enhanced by a discrimination of the community from the major population and a crowding out of the community from the labour market that materializes in excessive unemployment and inactivity rates.

On the other hand, an integration of the Roma community to the labour market could have a positive impact on the Slovak economy and help to (i) improve working habits of the community with positive implications for structural unemployment and potential production, (ii) improve poor living standards and reduce generational poverty without extensive social transfers from a public sector and (iii) limit a discrimination on the labour market with a positive impact on social interactions with the major population. While there is a number of active labour market policies that support an integration of excluded communities, it is important to compare them in both absolute and relative terms and evaluate their potential impact on an economic performance.

[1] Social exclusion affects also other population groups, for example homeless or addicted people.

In this thesis, we focus on two measures that were adopted by the Slovak Republic to reduce social exclusion of the Roma community and improve its integration to the labour market, the activation works and the inclusive programmes. While the activation works are based on a form of social transfers for participants in exchange of small manual jobs for regions or municipalities, the inclusive programmes are based on a form of wage subsidies for employers in exchange of offering work positions to excluded communities.

Even though the activation works help to reduce disposable unemployment in a short horizon, the positive effect in a medium horizon is limited by an unqualified character of the underlying work. On the other hand, the inclusive programmes propose one of the most promising methods to limit social exclusion and reduce structural unemployment, since a positive experience with the labour market could have a significant impact on social interactions and working habits of the excluded communities and thus improve their labour market prospects in both short and medium horizons, as discussed by Páleník et al. (2013). Furthermore, an additional income could help to improve living standards and reduce generational poverty of socially excluded communities, while their integration to the labour market could help to reduce direct and latent discrimination from the major population.

Next, to compare these policies and evaluate their potential impact on the Slovak economy, we construct a computable general equilibrium model of a small open economy with two types of producers and two types of households. First, we need to distinguish between standard and inclusive producers to incorporate a structure of the domestic labour market with two types of employees. Second, we need to distinguish between standard and excluded households to incorporate an income from active labour market policies and its impact on a behaviour of households. This approach thus allows us to incorporate the inclusive programmes that are supported by both private and public sectors and the activation works that are driven by social transfers and evaluate their economic implications.

We need to mention that the decomposition of producers and households is based on individual microeconomic data, in contrast to standard general equilibrium models. However, a novelty of this approach to active labour market policies and a uniqueness of social exclusion of the Roma community for the Slovak Republic make it impossible to calibrate the model from available literature. Therefore, to avoid arbitrary assumptions about a structure of excluded communities, inclusive producers and active labour market policies, we tend to apply the microeconomic data to identify different types of producers and households and dynamic effects of active labour market policies.

Furthermore, we focus on two different forms of inclusive employment, i.e. inclusive employers and social enterprises. While the inclusive employers operate as standard producers aiming to maximize their profits that obtain subventions from government for employing socially excluded communities, the social enterprises are explicitly designed for inclusive employment and operate similarly to non-profiting institutions. To compare these different forms of inclusive employment, we construct a computable general equilibrium model with a three-level production function that incorporates both standard and inclusive employees under different aggregation forms.

Specifically, we incorporate standard and inclusive employees into a production function as either perfect substitutes for the inclusive employers or perfect complements for the social enterprises. Since the inclusive employers aim to maximize their profits, they substitute both population groups in line with their productivity and labour costs. It is important to note that the labour costs of inclusive employees are partially compensated by subsidies from government. Therefore, they could be relatively effective for domestic producers despite their lower productivity. On the other hand, the social enterprises aim to provide the most inclusive environment for socially excluded communities and thus need to incorporate a fixed number of inclusive managers for a fixed number of inclusive employees. The labour costs of inclusive employees are then fully compensated by subsidies from government.

Computable general equilibrium models are regularly applied for evaluation of different tax policies, environmental regulations and trade strategies, due to their simple but rich structure, consistency with a macroeconomic theory and an ability to capture sectoral linkages within world economies.[2] Furthermore, these models could be applied also for an evaluation of potential benefits from the inclusive employment, see Kabir and Dudu (2020). On the other hand, to our best knowledge, we propose a novel approach to the evaluation of active labour market policies in line with a general equilibrium theory. It is important to note that there is a number of advantages of this approach over partial equilibrium methods, since we are able to capture (i) structural relationships in the Slovak economy, (ii) a different productivity of standard and inclusive employees, (iii) a different structure of standard and inclusive producers, (iv) different consumption habits of standard and excluded households and (v) dynamic effects of active labour market policies on domestic producers and households.

[2] For an introduction to computable general equilibrium models and their possible applications see Dixon and Jorgenson (2012) or Burfisher (2017).

Our thesis further contributes to the existing literature on active labour market policies by a novel approach to their evaluation with a computable general equilibrium model. While the other studies focus on labour market outcomes and cost benefit analyses of active labour market policies, we are able to evaluate macroeconomic effects of the activation works and the inclusive programmes and estimate their impact on (i) potential production, (ii) private consumption, (iii) domestic investment, (iv) public sector deficit and (v) public sector debt.

The aims of the thesis are (i) to outline negative implications of social exclusion on a formation of generational poverty and structural unemployment, (ii) to identify the communities that suffer from social exclusion and structural unemployment from individual microeconomic data, (iii) to describe different types of active labour market policies that support their integration to the labour market with a focus on the activation works and the inclusive programmes, (iv) to outline two forms of the inclusive labour market that operates on a basis of inclusive employers or social enterprises, (v) to propose a computable general equilibrium model of a small open economy with two types of producers and two types of households, (vi) to provide dynamization of the model by an accumulation function of a capital stock and a mobility function of activation workers and inclusive employees, (vii) to evaluate a potential impact of the activation works and the inclusive programmes on the Slovak economy under different model specifications, (viii) to evaluate an empirical impact of a policy shift from the activation works to the inclusive programmes on potential production and fiscal variables and (ix) to compare different forms of the inclusive labour market with a respect to structural unemployment and potential production.

The thesis is structured as follows. First, we provide a literature review of the most recent studies about generational poverty, inclusive growth, structural unemployment, active labour market policies and computable general equilibrium models. Second, we discuss the most popular functional forms and alternative approaches to the estimation of model elasticities. Third, we propose a recursive dynamic computable general equilibrium model of a small open economy with two types of producers and two types of households. Fourth, we present an underlying model dataset and describe the construction of a social accounting matrix. Fifth, we evaluate a potential impact of different types of active labour market policies on the Slovak economy and compare different forms of the inclusive labour market with a respect to structural unemployment and potential production. Finally, we discuss the results in the context of related literature and outline further extensions of the thesis.

2 Literature review

We provide a literature review of the most recent studies about poverty measures, inclusive growth, structural unemployment, active labour market policies and computable general equilibrium models. We thus analyse different aspects of social exclusion of minorities, popular methods to identify a degree of social exclusion and its potential improvement and alternative policies that aim to improve the employment of excluded communities. Finally, we discuss potential applications of computable general equilibrium models in the context of transition economies.

2.1 Generational poverty

There is a number of social and economic issues that result from the social exclusion of minorities. One of the most negative consequences is without a doubt a formation of generational poverty. To evaluate a degree of generational poverty, we need to construct reasonable poverty measures. The original approach by Sen (1976) criticises methods based on the headcount ratio and the poverty gap, since violating two basic axioms of poverty measures. While the monotonicity axiom ensures a decrease in the poverty index when a degree of poverty within poor population declines, the transfer axiom captures an increase in the poverty index after a direct transfer from poor to regular population. The author then proposes poverty measures that are consistent with the axiomatic approach.

In contrast, a popular paper by Foster et al. (1984) assumes that a correct poverty measure should be decomposable by subsectors along ethnic or geographical lines. Furthermore, the authors argue that the original measures by Sen (1976) are not additive by subsectors and thus fail the basic assumption that an increase in subsection indices should lead to an increase in a headline poverty index. On the other hand, standard decomposable measures violate the axioms proposed by Sen (1976). The authors thus provide alternative poverty measures that are additive by subsectors and satisfy the original axioms. These measures are known as the Foster-Greer-Thorbecke indices. The paper by Ravallion (1998) then argues that the previous research of poverty lines was mostly oriented on characteristics and comparison of different poverty measures and not on the correct identification of poverty lines. The author thus provides two methods to construct objective poverty lines that are based on food and energy intake and costs of basic needs together with subjective poverty lines that are based on a minimum income.

Furthermore, it could be quite difficult for socially excluded communities to break the loop of generational poverty. The theory of poverty traps stands in contrast to the assumption that a lack of disposable income could be overcome by hard work and a reduction in consumption. Contrary to this, an economic system requires a lot of physical and human capital to escape the poverty trap what leads to a self-reinforcing cycle of poverty. Azariadis and Stachurski (2004) further state that an acquisition of capital could be limited by market or institutional failures what limits an individual responsibility for poverty. However, the detection of poverty traps could be quite problematic due to short data samples and measurement errors as pointed out by Antman and McKenzie (2007).

2.2 Inclusive growth

The existence of poverty traps has further inspired economic researchers to introduce an alternative measure for economic growth that leads to the reduction of poverty over time. The key measurement tool is a growth incidence curve (GIC) that provides growth rates by quantiles ranked by an income level of particular population groups. Taking the area under this curve up to a specified poverty line then gives the estimation of the pro-poor growth. For further information see Ravallion and Chen (1999). However, these measures give no additional information about a degree of poverty reduction or inequality improvement and thus belong to the partial ordering approach.

On the other hand, the complete ordering approach assumes that a correct measure of the pro-poor growth should improve inequalities in an economy but also provide information about a degree of this improvement. See for example the poverty bias of growth (PBG) of McCulloch and Baulch (2000) and the pro-poor growth index (PPGI) of Kakwani and Pernia (2000). However, even though these measures capture a distribution of growth benefits between both regular and poor population, they do not incorporate an actual level of economic growth. Contrary to this, the poverty equivalent growth rate (PEGR) of Kakwani and Son (2008) includes both an actual growth rate under average disposable income and a distribution of growth benefits between different types of population.[3]

However, we should be interested not only in the reduction of poverty but in both pace and pattern of economic growth with a focus on sustainability and inclusiveness, or in other words, in the inclusive growth. Ianchovichina and Lundstrom (2009) assume that the most important constraints to the inclusive growth are determined by an access to domestic and

[3] For further information see Jmurova (2017).

international markets, a distribution of information and education and an effectiveness of government.[4] Therefore, we need to question, whether the economic growth in the Slovak Republic was able to reduce income inequalities between the excluded communities and the major population and thus limit the formation of generational poverty. However, since Domonkos et al. (2013) observe a negative relationship between an increase in economic growth and a decline in income inequalities in the Slovak Republic, we could assume that the economic growth in the Slovak Republic was not oriented on the excluded communities. An important objective should be then the evaluation of different types of labour market policies and their impact on an economic performance and a degree of social exclusion, as discussed in the work of Páleník et al. (2015).

2.3 Structural unemployment

Another negative consequence of social exclusion is a formation of structural unemployment with further negative implications for potential production. This is a very relevant issue for the Slovak economy that operates with excessive levels of structural unemployment with a regional concentration and an accumulation of social exclusion, as was pointed out by Páleník (2015). Even though the Slovak Republic is in the middle of the European countries in terms of national unemployment on the level of 6.7%, it has one of the highest rates of long-term unemployment in the European Union on the level of 3.2%.[5] The reduction of structural unemployment could be achieved by boosting a labour demand with new work positions and wage subsidies for employers or by supporting human capital with education and training of excluded communities, as was pointed out by Jusko (2015). We need to mention that we focus on the demand types of inclusive programmes. An evaluation of the supply types of inclusive programmes is beyond the scope of this thesis.

Furnham (1982) then provides three basic explanations of unemployment: individualistic, social and fatalistic. The individualistic reasons explain the unemployment with a personal disposition like a lack of ability or effort. On the other hand, the social reasons explain the unemployment with a public disposition like a failure to pursue effective labour market policies. Finally, the fatality reasons explain the unemployment with a set of uncontrollable parameters like a lack of chances or luck. Even though the excessive unemployment of the

[4] For an evaluation of the inclusive growth in the European Union see Domonkos et al. (2015).

[5] These numbers are consistent with the Labour Force Survey of the European Union in the recent year (2020). We obtain them from the Eurostat database.

Roma community could be viewed as a combination of these factors, we focus on the social factor as the most important explanation of this phenomenon. We thus assume that active labour market policies could provide an effective method to reduce social exclusion and structural unemployment of the Roma community. The unemployment drivers were further extended in a number of studies, see for example the paper by Mylonas et al. (2016) that examines unemployment explanations across different countries and cultures.

Another branch of economic literature analyses an impact of unemployment benefits on the structural unemployment. Nakajima (2011) estimates that an increase in unemployment is driven by three main indicators: an extension of unemployment benefits, an increase in a separation rate and a poor probability to find a job. However, Nekoei and Weber (2017) state that while an impact of unemployment insurance on a duration of unemployment is well documented in a number of studies, an impact of unemployment benefits on a quality of reemployment and underlying wages remains unknown.

Specifically, while a duration of unemployment could be driven by a simple delay in job acceptance and thus leads to the reduction in reemployment wages, an extension of unemployment benefits could lead to an improvement in opportunities and thus result in better jobs with higher wages. Nekoei and Weber (2017) estimate that the latter effect dominates over the first one, thus leading to a positive impact of unemployment benefits on reemployment wages. On the other hand, Card et al. (2007) find no relationship between the unemployment benefits and the reemployment wages and Schmieder et al. (2016) estimate negative effects of the unemployment benefits that result from the duration dependence.

2.4 Labour market policies

We continue with a summary of active labour market policies in the OECD countries that is provided by Meager and Evans (1998). The authors summarize results from a number of evaluation studies within the OECD countries and advantages and drawbacks of main evaluation methods. The authors favour evaluation methods that are oriented on targets rather than programmes and suggest that labour market policies that include both public and private sectors propose the best results with a respect to structural unemployment. On the other hand, a summary of Martin and Grubb (2001) stands that the evaluation findings are not very encouraging at the first sight but there are some successful stories, for example job search assistance and training programmes. The authors further assume that wage subsidies could help their participants but may suffer from dead-weight and substitution effects.

More recent studies provide mixed results of active labour market policies. On the one hand, Crepon and Van den Berg (2016) declare that evaluations have not shown these policies to be particularly effective and McKenzie (2017) states that these policies are much less effective than policymakers usually assume. On the other hand, Escudero (2018) states that active labour market policies reduce unemployment rates and increase participation rates and the positive effects seem to be particularly beneficial for low-skilled participants. Furthermore, Card et al. (2018) declare that average impacts of these policies are close to zero in a short horizon but become more positive in a medium horizon. The authors then favour programmes that emphasize an accumulation of human capital.

The structure of active labour market policies is also very important, as pointed out by a number of studies. For example, a meta-analysis of Kluve (2010) declares that while direct employment in a public sector frequently appears detrimental, wage subsidies in a private sector can be effective in improving labour market outcomes. These results are further consistent with a meta-analysis of Card et al. (2010). The authors also state that job search assistance is more effective in a short horizon and training programmes are more effective in a long horizon. Finally, a meta-analysis of Vooren et al. (2018) declares that public employment and wage subsidies have negative impacts in a short run but gradually improve and turn positive in a long run. On the other hand, job search assistance and training programmes stay positive on an entire horizon. The job search assistance then shows the best results in a short run and the wage subsidies provide the best results in a long run.

It is also important to note that active labour market policies may be influenced by a number of external factors, for example a cyclical position of an economy. Brown and Koettl (2015) declare that measures to retain work positions should be used only for short periods of time in economic recessions, while measures to create work positions are very effective during economic recoveries. Furthermore, the authors state that activation works are not very effective in terms of labour market outcomes but may be beneficial for a reduction of poverty and inequalities. Finally, the authors declare that training programmes are more effective over time and when targeting excluded communities.

Harvan (2011) then analyses active labour market policies in the Slovak Republic with a focus on graduate practices and activation works. The author suggests that while the graduate practises lead to a better outcome of the participants on the labour market, the activation works may have an opposite effect. Other evaluation studies from the Slovak Republic are not very encouraging. Štefánik (2014) does not estimate a positive impact

of training programmes on labour market outcomes and Karasová et al. (2019) declare that a current composition of active labour market policies has a limited impact on the Roma community. On the other hand, Páleník et al. (2013) propose that the inclusive programmes could provide more positive results in terms of labour market outcomes and their impact on an economic performance.

2.5 Macroeconomic models

Next, we discuss potential applications of computable general equilibrium (CGE) models for a number of different purposes. These models are regularly applied for evaluation of different tax policies, environmental regulations and trade strategies, due to their simple but rich structure, consistency with a macroeconomic theory and an ability to capture sectoral linkages within world economies These models are further applied to analyse transitional changes on financial and labour markets of post-communist economies and potential implications of the European integration. We will focus on the economies of the Central and Eastern Europe (CEE), due to their transitional economic structure and the undergone economic transformation similar to the Slovak Republic.[6]

There is a number of CGE models for Poland that analyse important changes in trade liberalisation and environmental regulations and the undergone economic transition to a free market economy. The model of De Haan (1993) analyses economic implications of transitional changes in nominal wages, interest rates and exchange rates, while the model of Roberts and Zolkiewski (1996) focuses on transitional changes in domestic production and export of commodities. The model of Gupta and Lensink (1998) then analyses transitional changes on the financial market as the deregulation of interest rates and the decline in reserve requirements of domestic banks.

The model of Roberts and Round (1999) extends traditional production sectors for import of commodities with limited substitution effects and thus analyses an empirical impact of trade liberalisation on the Polish economy. On the other hand, the model of Piazolo (2000) aims to analyse economic implications of the European integration by a decline in import tariffs, a reduction of border costs and trade barriers and an increase in direct payments from the European Union to Poland.

[6] For a detailed overview of computable general equilibrium models for the Central and Eastern European Union member states see Mohora and Bayar (2007).

Furthermore, we mention the model of Van Leeuwen (1997) that focuses on economic implications of environmental shocks under an assumption that different production sectors produce different types of greenhouse gas emissions. The model further assumes that there is a free market with emission allowances. The production sectors thus aim to maximize their profits from a reduction of greenhouse gas emissions and a trading with emission allowances. On the other hand, the model of Kiuila (2003) aims to minimize sulphur dioxide emissions in the Polish economy, in line with international agreements. The model operates with two types of households, the poor ones and the rich ones, with different social views of environmental regulations.

We continue with CGE models for other transitional economies. The model of Zalai (1993) combines aspects of both centrally planned and free market economies to analyse potential implications of trade liberalization in Hungary. The model further distinguishes between two types of the balance of payments. On the other hand, the model of Tarhoaca (2000) focuses on the Armington trade specification to analyse potential implications of trade liberalization in Romania. The authors then simulate a positive shock to foreign investment and world export prices and a negative shock to foreign savings and world import prices.

The model of Vanags (2002) analyses economic implications of the European integration of Latvia by an elimination of import tariffs on industrial goods and an integration of agricultural production to the common market. The model of Majcen et al. (2005) then focuses on economic implications of the European integration of Slovenia. The authors construct a central financial fund that collects all transfers from the European Union to redistribute them in line with their purpose.

Furthermore, we mention the model of Jensen and Lassila (2002) that analyses alternative pension strategies in Lithuania. The authors develop a model of overlapping generations to simulate potential implications of an increase in the pension age, a decline in pension contributions, an increase in pension transfers and a transition to the second pension pillar. On the other hand, the model of Funke and Strulik (2003) aims to evaluate a tax reform in Estonia. The authors focus on the reformation of labour income taxes, capital income taxes and value added taxes and its impact on an economic performance.

Finally, we discuss different applications of CGE models in the Slovak Republic. We start with the model of Benčík (2001) that analyses an empirical impact of import prices on domestic production. The model of Brunovský et al. (2002) then analyses alternative tax strategies in the context of a tax reform in Slovakia. The authors suggest that a flat rate of

value added taxes leads to an increase in a gross domestic product and that a decline in corporate income taxes that increases private investment should be more effective than a decline in personal income taxes that increases private consumption. We continue with the model of Kotov and Páleník (2003) that aims to analyse economic implications of the European integration by a modification of value added taxes, a decline in import tariffs, a modification of selected income taxes, an increase in environmental regulations and an increase in direct payments from the European Union to Slovakia.

The model of Páleník et al. (2004) analyses foreign investment in the automotive sector that result from new car factories in the Slovak Republic. The model of Miťková (2009) also focuses on the automotive sector to analyse an empirical impact of domestic exports and export prices on an economic performance. Furthermore, the model of Domonkos and Pániková (2009) focuses on the transportation sector to analyse different shocks in train and rail transportation. Finally, the model of Miklošovič (2014) aims to analyse important changes in the Slovak economy including the investment boom in the banking sector, the taxation shift from direct to indirect taxes and the process of the European integration.

3 Functional forms

A production function is an important component of a general equilibrium theory that pins down a supply side of economies in a number of macroeconomic models. These functions incorporate a set of production factors, for example labour and capital, to describe potential production in economies. The most basic functional forms are a linear function of perfect substitutes, a Leontief function of perfect complements and a Cobb-Douglas function of a unit elasticity of substitution. If we assume a production function that transforms labour (LT) and capital (KT) production factors into potential production (YT), we can summarize the Cobb-Douglas function in the Eq.1. To further distinguish between different types of commodities, we label production sectors by *c* and time periods by *t*.

$$\mathrm{YT}_{c,t} = \alpha_c * \mathrm{LT}_{c,t}^{\beta_c} * \mathrm{KT}_{c,t}^{1-\beta_c} \qquad \text{Eq.1}$$

Despite being a very popular functional form, a number of studies suggest that the unit elasticity of substitution that is required by the Cobb-Douglas function is not proven to be the best choice for particular countries and production sectors. In line with this observation, a number of macroeconomic models incorporate more general versions of production functions that target the issue of a unit elasticity of substitution. The most popular one is a Constant elasticity of substitution (CES) function that could be viewed as a generalization of the basic functional forms. Specifically, setting the elasticity of substitution to (i) infinite value results in the linear function, (ii) zero value results in the Leontief function and (iii) unit value results in the Cobb-Douglas function. There are different forms of the CES function that are applied in macroeconomic models. The most popular one is the version of Arrow et al. (1961) that extends the original version of Pitchford (1960) for the Hicks neutral technological change. If we assume a production function that transforms labour (LT) and capital (KT) production factors into potential production (YT), we can summarize the CES function in the Eq.2. Again, we label production sectors by *c* and time periods by *t*.

$$\mathrm{YT}_{c,t}^{\theta_c} = \alpha_c^{\theta_c} * \beta_c * \mathrm{LT}_{c,t}^{\theta_c} + \alpha_c^{\theta_c} * (1-\beta_c) * \mathrm{KT}_{c,t}^{\theta_c} \qquad \text{Eq.2}$$

The parameter α_c denotes an absolute effectivity of production factors or the Hicks neutral technological change, the parameter β_c denotes a relative effectivity of the labour factor, the parameter $1-\beta_c$ denotes a relative effectivity of the capital factor and the parameter θ_c denotes a parameter of substitution that is linked to an elasticity of substitution σ_c with a transformation function $\theta_c = 1 - 1/\sigma_c$. Following the common approach for computable

general equilibrium models, we need to estimate the elasticity of substitution outside the model, calibrate the relative effectivity of production factors from first order conditions and calibrate the absolute effectivity of production factors from the production function. The constant elasticity of substitution (CES) function thus requires us to estimate the elasticity of substitution and cannot be fully calibrated from a social accounting matrix (SAM) as other components of computable general equilibrium models. The estimation of output elasticities is usually based on least squares techniques.

This identification issue is even more pronounced in the Armington model of international trade that incorporates the import of commodities under a constant elasticity of substitution and the export of commodities under a constant elasticity of transformation. The trade elasticities of such framework are an important part of computable general equilibrium models that are often referred to as the Armington elasticities of international trade. The estimation of substitution and transformation elasticities is based on a variety of methods and techniques. The toolkit varies from econometric models that are based on time-series or cross-sectional regressions to structural models that tend to incorporate microeconomic fundamentals and mutual relationships between the trade elasticities. While the econometric methods rely on least squares techniques to independently estimate functional parameters of the Armington model, the structural methods estimate the trade elasticities either sequentially through a firm-level productivity or simultaneously through impulse response functions to demand and supply shocks in economies.

3.1 Domestic production

Identification of the elasticity of substitution can be based on a variety of methods that aim to estimate the CES function with least squares techniques under different model assumptions. Some of these methods tend to approximate the production function with linear approximations, for example a popular method of Kmenta (1967) that is based on the Taylor series. Although these methods lead to a simple identification of model parameters, the linear approximation might be an imprecise simplification of the CES function, especially for a high number of production factors.

On the other hand, an alternative method of Mishra (2006) estimates the CES function with nonlinear optimization techniques that are based on the minimization of a residual sum of squares, for example the Quasi-Newton algorithms, the Differential evolution algorithm or the Repulsive particle swarms. Mishra (2006) further suggests that global optimization

techniques perform better than standard gradient-based methods. However, as discussed by Henningsen and Henningsen (2012), the nonlinear estimation of the CES function can lead to unstable and imprecise estimates of model parameters due to convergence problems that result from large flat areas of the objective function, discontinuity of the production function and significant rounding errors for the elasticity of substitution close to unity.

The authors then provide solutions to these issues by (i) removing the discontinuity of the production function and its derivatives by limits, (ii) removing the rounding errors by local linear approximations and (iii) handling the problems with ill-behaved objective functions with a grid search procedure. Subsequently, a number of authors apply these modifications for the estimation of nested production functions, see for example the papers of Koesler and Schymura (2012) or Shen and Whalley (2013).

Another way to overcome the issues with linear approximations and nonlinear optimization techniques is discussed by Okagawa and Ban (2008). However, since this approach is based on a system of linear equations that are derived from a theory of profit maximization and corresponding first order conditions, it requires reliable price data on a set of production factors to identify the elasticity of substitution.

3.2 International trade

The extension of computable general equilibrium models for open economies requires us to incorporate the trade variables, i.e. export of commodities and import of commodities. The most popular approach is based on the Armington model of international trade that incorporates the import under a Constant elasticity of substitution (CES) function and the export under a Constant elasticity of transformation (CET) function. The total number of commodities that are consumed on a domestic market is then implied by domestic sales and import of commodities. The total number of commodities that are produced on a domestic market is further distributed between domestic sales and export of commodities.

Estimation of the trade elasticities is thus crucial for a correct identification of international trade in computable general equilibrium models. As stated in Hillberry and Hummels (2012), there is a variety of methods to estimate the trade elasticities with different assumptions and different outcomes. In particular, the estimation of import elasticities that is based on a time-series approach, see for example Gallaway et al. (2003), leads to the estimates around unity, while the estimation of import elasticities that is based on a cross-section approach, see for example Hertel et al. (2007), leads to significantly higher estimates. Furthermore,

since the time-series approach is based on the substitution between domestic sales and import of commodities within the same industry, it may suffer from identification problems and measurement errors. On the other hand, since the cross-section approach is based on the substitution between different foreign sources and trading partners, it can be used only for selected countries and time periods.

An important question is whether the differences between these estimation methods arise from different purposes, i.e. domestic to foreign versus foreign to foreign elasticities, different approaches, i.e. time-series versus cross-section methods, and different time periods, i.e. low-frequency versus high-frequency data, or due to identification problems and measurement errors. Hillberry and Hummels (2012) suggest that even though the domestic to foreign elasticities could be lower than the foreign to foreign ones, the time series estimates could be biased downwards due to the issues with underlying datasets. Reliable price data are thus crucial for a correct identification of the trade elasticities.

As stated in Feenstra (2010), the estimation of export elasticities could be then derived from micro-foundations and linked to structural parameters of Melitz (2003). Specifically, if we assume a market of monopolistically competitive firms varying in their productivity with the more productive firms that are engaged in exports and the less productive firms that are selling only to the domestic market, we can identify the export elasticities through the import elasticities and a probability distribution of a firm-level productivity.

Another group of estimation methods combine information about exports and imports between individual trading partners to estimate the trade elasticities. However, since both demand and supply parameters need to be separately identified, instrumental variables are usually applied to distinguish between demand and supply shocks and thus allow for a separate identification of trade elasticities. Erkel-Rousse and Mirza (2002) show that the least squares estimation leads to the estimates close to unity, while an application of instrumental variables significantly increases the estimates of trade elasticities.

Finally, a popular method of Feenstra (1994) and its later extension by Broda and Weinstein (2006) estimate the trade elasticities from a system of demand and supply equations without an application of instrumental variables. Contrary to this, these methods are based on the work of Leamer (1981) that describes a hyperbolic relationship between price and quantity shocks to identify both demand and supply parameters. Specifically, a positive correlation between prices and quantities implies a higher volatility of the demand shocks and tight restrictions on the export elasticities. On the other hand, a negative correlation between

prices and quantities implies a higher volatility of the supply shocks and tight restrictions on the import elasticities. Finally, if we assume that both demand and supply elasticities are common across trading partners, we can identify the intersection of corresponding hyperbolas and thus estimate the trade elasticities.

3.3 Functional elasticities

The country-level estimation allows for a simultaneous identification of trade elasticities by distinguishing between demand and supply shocks to an economy and thus restricts the trade elasticities from a macroeconomic point of view. These estimation results are then applicable in models of international trade. On the other hand, the firm-level estimation incorporates a firm-level productivity in an economy and thus restricts the trade elasticities from a microeconomic point of view. These estimation results are then applicable in models with sectoral linkages. However, since in this thesis we analyse a single economy without sectoral linkages, we focus on the econometric identification of trade elasticities between domestic sales and trade of commodities.

Higher trade elasticities could be then represented as a better substitutability and a better transformability between domestic and foreign factors and thus a less painful adaptation to different macroeconomic shocks. Specifically, after a negative supply shock hits an economy, the decline in domestic production could be compensated by an increase in imports with a relatively small impact on domestic consumption, due to a higher import elasticity. On the other hand, after a negative demand shock hits an economy, the decline in domestic consumption could be compensated by an increase in exports with a relatively small impact on domestic production, due to a higher export elasticity.

Considering the first order conditions, the trade elasticities could be also represented through a channel of prices. A unit elasticity of substitution in fact means that a decline in the ratio between domestic and imported goods is transformed one-to-one to the ratio between domestic and imported prices. In other words, a negative supply shock is fully transformed into higher prices of domestic goods, due to a low substitutability between domestic and foreign goods and thus an ability of domestic producers to compensate a decline in quantities with an increase in prices. On the other hand, if we consider higher import elasticities, only a part of the decline in quantities could be transformed into the increase in prices, due to an ability of domestic consumers to substitute between domestic and imported goods.

A unit elasticity of transformation then means that a decline in the ratio between domestic and exported goods is transformed one-to-one to the ratio between domestic and exported prices. In other words, a negative demand shock is fully transformed into lower prices of domestic goods, due to a low transformability between domestic and foreign goods and thus an ability of domestic consumers to transform a decline in quantities into a decline in prices. On the other hand, if we consider higher export elasticities, only a part of the decline in quantities could be transformed into the decline in prices, due to an ability of domestic producers to allocate between domestic and exported goods.

Taking the estimates differently, a positive shock to domestic prices leads to a significant increase in imports, due to a better substitutability between domestic and foreign goods. Higher import elasticities thus imply a higher price sensitivity of domestic consumers with a respect to the unit elasticity of substitution. On the other hand, a negative shock to domestic prices leads to a significant increase in exports, due to a better transformability between domestic and foreign goods. Higher export elasticities thus imply a higher price sensitivity of domestic producers with a respect to the unit elasticity of transformation.

4 Macroeconomic model

To compare different types of active labour market policies and evaluate their potential impact on an economic performance we construct a recursive dynamic computable general equilibrium model of a small open economy with two types of producers and two types of households. Specifically, we decompose the sector of households into standard and excluded components and the sector of producers into standard and inclusive components. First, we identify the excluded households from a database of excluded communities of the Institute for Financial Policy (IFP). This database is based on individual microeconomic data and a set of social and economic characteristics. Second, we identify the inclusive producers from a database of domestic firms as the employers that offer work positions to the excluded communities. A total amount of the inclusive commodities is then equal to the production of the inclusive producers in the economy.

We further define a three-level production function that incorporates both standard and inclusive employees under different aggregation forms for inclusive employers and social enterprises. The number of inclusive employees is set by the government under a transformation function for employment subventions. On the other hand, the number of standard employees is implied by an optimal allocation of production factors.

Furthermore, we extend the model for a basic structure of the domestic labour market with a definition of the labour demand and the labour supply. We are thus able to estimate dynamic effects of active labour market policies on unemployment and participation rates. Finally, we provide a dynamization of the model with an accumulation function of a capital stock and a mobility function of activation workers and inclusive employees. It is important to note that while the inclusive programmes enter the production function as wage subsidies for employers and thus contribute to the domestic production, the activation works are not a part of the production chain and enter the model as social transfers of households. These assumptions are consistent with the development of national accounts.

4.1 Block of employment

We apply a three-level production function for the inclusive producers to differentiate between alternative forms of inclusive employment. In the first step, we aggregate both types of employees (LE) into a labour production factor (LT) of inclusive producers under different aggregation forms for inclusive employers and social enterprises. We label the standard employees by *s*, the inclusive employees by *i* and time periods by *t*.

In the case of inclusive employers, we assume that these producers aim to maximize their profits from both labour inputs based on their productivity and labour costs. We thus assume that a fixed number of standard employees could be substituted for a fixed number of inclusive employees and aggregate them as perfect substitutes under a linear functional form (Eq.3). While the labour costs of standard employees are paid only by the producers and are thus subject to the optimization process, the labour costs of inclusive employees are partially paid by the subsidies from government and only a part of them is set by the optimal allocation of production factors.

$$LT_{i,t} = \kappa_s * LE_{s,t} + \kappa_i * LE_{i,t} \qquad \text{Eq.3}$$

In the case of social enterprises, we assume that these producers aim to provide the most inclusive environment for socially excluded communities and thus need to incorporate a fixed number of inclusive managers for a fixed number of inclusive employees. Both types of employees are then perfectly complemental to each other and we aggregate them under a Leontief functional form (Eq.4). Specifically, we assume that one inclusive manager is necessary for the employment of four inclusive employees in a baseline scenario and then provide a sensitivity analysis for this parametrization.

$$LT_{i,t} = 1/\pi_s * LE_{s,t} = 1/\pi_i * LE_{i,t} \qquad \text{Eq.4}$$

To close the model, we need to impose two additional restrictions on the distribution of standard and inclusive employees on the domestic labour market. First, we assume that the government controls for the number of inclusive employees that are set exogenous to the model (IN) and thus need to write $LE_{i,t} = IN_t$. Second, we assume a perfect mobility of labour of standard employees, in line with the model of Corong et al. (2017), and thus need to write $PE_{s,t} = PL_{s,t}$ for labour costs of employees (PE) and the price of labour (PL).[7] The labour production factor (LT) of standard producers is then equal to a simple difference between domestic employment (DE) and the number of standard employees or inclusive managers that are implied by the inclusive producers (Eq.5).[8]

$$LT_{s,t} = DE_t - LE_{s,t} \qquad \text{Eq.5}$$

[7] The labour costs of standard employees are thus equal in both production sectors.

[8] We need to mention that the domestic employment in the model consists only of the standard employees and not the inclusive employees nor the activation workers.

The inclusive managers operate as standard employees under average labour costs that are set by the optimal allocation of production factors. On the other hand, the labour costs of inclusive employees are paid by the government and are thus not subject to the optimization process. Social enterprises are thus more expensive than inclusive employers for the government, since no part of the labour costs of inclusive employees is paid by domestic producers. Furthermore, since the government controls for the number of inclusive employees, it controls also for the number of inclusive managers in social enterprises, what leads to the crowding out of the labour factor from more effective production sectors and thus limits the formation of value added in the domestic economy.

4.2 Block of production

In the second step, we incorporate a labour factor (LT) and a capital factor (KT) to explain value added (VA) in both production sectors under a Cobb-Douglas functional form (Eq.6). We thus assume a unit elasticity of substitution between labour and capital production factors, in line with the estimation results of Lichner and Miklošovič (2011). Even though on the level of individual industries, the estimates of substitution elasticities are significantly different from unity, the average substitution elasticity in the Slovak economy is estimated close to unity and thus does not reject the Cobb-Douglas function. We further label the production sectors by *c* and time periods by *t*.

$$\mathrm{VA}_{c,t} = \psi_c * \mathrm{LT}_{c,t}^{\varphi_c} * \mathrm{KT}_{c,t}^{1-\varphi_c} \qquad \text{Eq.6}$$

On the other hand, we aggregate intermediate inputs (IC) of standard and inclusive commodities under a Leontief functional form (Eq.7) to obtain intermediate consumption in both production sectors. The Leontief function is regularly applied for the aggregation of sectoral commodities under an assumption that different production sectors, for example agriculture and construction, produce complemental products that could not be replaced by each other in a production chain. This functional form would be thus accurate if the standard producers and the inclusive producers operate in different production sectors. We could then see from microeconomic data that the inclusive producers are significantly biased towards the sector of manufacturing, and are thus relatively complemental to the standard producers. We label the production sectors by *c*, the standard commodities by *s*, the inclusive commodities by *i* and time periods by *t*.

$$\mathrm{IC}_{c,t} = 1/\omega_s * \mathrm{IC}_{c,s,t} = 1/\omega_i * \mathrm{IC}_{c,i,t} \qquad \text{Eq.7}$$

In the last step, we model total production (YT) in both production sectors as a function of value added (VA) and intermediate consumption (IC), in line with the model of Shen and Whalley (2013). We assume that the degree of substitution between these production factors could be different from unity and thus merge them under a Constant elasticity of substitution function (Eq.8). Furthermore, we link the parameter of substitution θ_p to the elasticity of substitution σ_p with a transformation function $\theta_p = 1 - 1/\sigma_p$ and thus simplify the model notation.[9] Corresponding prices are pinned down by the first order conditions, in line with a zero-profit assumption.[10]

$$YT_{c,t}^{\theta_p} = \alpha_c^{\theta_p} * \beta_c * VA_{c,t}^{\theta_p} + \alpha_c^{\theta_p} * (1 - \beta_c) * IC_{c,t}^{\theta_p} \qquad \text{Eq.8}$$

Estimation of the elasticity of substitution σ_p is then based on the first order conditions, in contrast to the direct estimation of the production function. While the direct approach requires an application of differential equations and constant growth rates to incorporate the Hicks neutral component α_c that increases over time, the estimation based on the first order conditions abstract from this parameter, in line with the first derivation of the production function, and thus provides much simpler and less biased estimation. Furthermore, since we want to calibrate the Hicks neutral component α_c from a benchmark period, we prefer not to estimate it from historical data.

4.3 Block of households

Consumption of commodities by standard and excluded households is based on a theory of utility maximization. Specifically, we assume that both types of households maximize their utility from standard and inclusive commodities under a Stone-Geary functional form (Eq.9) that is suitable for different types of households with different living standards and poverty levels. The Stone-Geary function distinguishes between necessary and additional consumption where the first one captures a subsistence minimum of particular households and the latter one captures a marginal utility from additional consumption of particular commodities. It further implies that the total consumption (CT) of the commodity *c* by the household *h* can be decomposed into the necessary consumption (NC) of the commodity c by the household *h* and a share of the commodity *c* on the additional consumption of the

[9] We modify the standard definition of the CES function with a negative exponent.

[10] It is important to note that the zero profit of domestic producers does not imply the zero profit of domestic firms, since we incorporate a net operating surplus into the price of capital.

household *h*. The additional consumption of the household *h* is then equal to a disposable income (DI) of the household *h* minus the necessary consumption of both types of commodities. Finally, we need to adjust the equation for prices of particular commodities (PQ) to eliminate the discrepancies between nominal and real variables.

$$CT_{h,c,t} = NC_{h,c,t} + \gamma_c * \frac{DI_{h,t} - \sum_c NC_{h,c,t} * PQ_{c,t}}{PQ_{c,t}} \qquad \text{Eq.9}$$

Next, we determine a disposable income of both types of households from budgetary restrictions and constant savings rates. It is important to note that the savings of excluded households are set to zero under an assumption that the excluded communities consume their entire income. However, even though the standard households save a part of their income, they still consume more per person than the excluded households. Calibration of the subsistence minimum is then based on the Frisch parameter of substitution that is set to 1.05, in line with related literature.[11] Even though the Frisch parameter does not directly enter the Stone-Geary function, the calibration of the subsistence minimum is essentially based on this parameter, as pointed out by Gharibnavaz and Verikios (2018). We further assume that the subsistence minimum per person is equal across different types of households and varies only for different types of commodities and thus calibrate the necessary consumption of standard and excluded households from the subsistence minimum per person and the number of persons within both population groups.

4.4 International trade

Export and import of both types of commodities is captured by the Armington model of international trade. We thus assume that total production (YT) of standard and inclusive commodities distributes between domestic sales (DT) and domestic export (XT) under a Constant elasticity of transformation function (Eq.10). Furthermore, we link the parameter of transformation θ_x to the elasticity of transformation σ_x with a transformation function $\theta_x = 1 + 1/\sigma_x$. The export prices are then implied by external world prices and a nominal exchange rate that are set exogenous to the model. This is driven by an assumption that a small open economy of the Slovak Republic has no impact on a development of external world prices. The absence of an independent monetary policy further implies a constant value of a nominal exchange rate within a monetary union of the euro area.

[11] For further references see Miklošovič (2014).

$$YT_{c,t}^{\theta_x} = \upsilon_c^{\theta_x} * \xi_c * XT_{c,t}^{\theta_x} + \upsilon_c^{\theta_x} * (1 - \xi_c) * DT_{c,t}^{\theta_x} \quad \text{Eq.10}$$

On the other hand, we assume that total consumption (QT) of both standard and inclusive commodities consists of domestic sales (DT) and domestic import (MT) under a Constant elasticity of substitution function (Eq.11). It is important to note that the import of inclusive commodities is set to zero, since the total amount of inclusive commodities needs to be equal to the production of inclusive producers. Furthermore, we link the parameter of substitution θ_m to the elasticity of substitution σ_m with a transformation function $\theta_m = 1 - 1/\sigma_m$. The import prices are further implied by external world prices and a nominal exchange rate that are set exogenous to the model.

$$QT_{c,t}^{\theta_m} = \nu_c^{\theta_m} * \zeta_c * MT_{c,t}^{\theta_m} + \nu_c^{\theta_m} * (1 - \zeta_c) * DT_{c,t}^{\theta_m} \quad \text{Eq.11}$$

Estimation of the trade elasticities is based on the first order conditions, in line with the method of Gallaway et al. (2003). Specifically, we perform a logarithmic transformation of the first order conditions and estimate them from historical time series of real and price variables. The estimates of both trade elasticities are significantly higher than unity and thus impose a high degree of substitution and transformation between domestic and external markets. The estimation results are thus in line with related literature on trade elasticities, see for example Hillberry and Hummels (2012).

4.5 Budgetary restrictions

A budget of households is implied by labour and capital factors and social and activation transfers that are further distributed between private consumption, public labour taxes and savings of households. On the other hand, a budget of firms is implied by an operating surplus that is further distributed between total capital taxes and savings of firms. Public revenues then consist of public labour taxes, total capital taxes, consumption taxes, production taxes and total import taxes under constant tax rates. The public labour taxes are paid by both types of employees and the total capital taxes are paid by the domestic firms. On the other hand, the consumption taxes are paid from both types of commodities and the production taxes are paid by both types of producers. Public expenditures then consist of public consumption, total social transfers, wage subsidies and activation transfers. A current account is further implied by a trade balance of standard and inclusive commodities and savings of government define a public sector deficit and a public sector debt. The budgetary restrictions are also extended for intersectoral transfers that are set exogenous to the model.

4.6 The labour market

Next, we extend the model for a basic structure of the domestic labour market with a definition of labour demand and a definition of labour supply. First, we exogenize domestic employment in each simulation period with a mobility function of activation workers and inclusive employees. It is important to note that the domestic employment in the model consists only of the standard employees and not the inclusive employees nor the activation workers. Second, we define national employment as a sum of domestic employment and a migration balance that is set exogenous to the model. We further exogenize an amount of unemployment and inactivity in the standard population and distribute the excluded population between unemployment and inactivity in fixed shares that are set from a benchmark period. Finally, we define a national labour force as a sum of national employment and unemployment and a national population as a sum of national labour force and inactivity. The rate of unemployment is then equal to a ratio between the national unemployment and the national labour force and the rate of participation is equal to a ratio between the national labour force and the national population.

We further assume that government controls for the number of activation workers and inclusive employees in each simulation period by subventions on active labour market policies. While the activation subventions are paid to households in a form of social transfers, the inclusive subventions enter the production function as wage subsidies for employers. Finally, we assume that the activation workers obtain a fixed activation transfer and the inclusive employees obtain a fixed labour income in each simulation period. These assumptions are very important for alternative scenarios where we derive a degree of participation of excluded communities from the subventions per person.

In a baseline scenario, we calibrate the subventions per person from a benchmark period and fix them as constant on a simulation horizon. It is important to note that the alternative policies are not budgetary neutral, since the inclusive programmes are based on wage subsidies for employers that are further adjusted for taxes and contributions, in contrast to the activation works that materialize in social transfers of households. Furthermore, the inclusive programmes result in a higher productivity than the activation works, due to a more qualified character of the underlying work. The subventions for the inclusive programmes are thus significantly higher than the subventions for the activation works but most of them are paid off by themselves. Finally, we assume that both producers and households adapt their decisions in line with the subventions from government.

4.7 The capital market

Allocation of investment between standard and inclusive sectors is based on a method of Lemelin (2007) that builds on the work of Jung and Thorbecke (2001). Specifically, we assume that a production sector with a stronger return to capital attracts more investment in each simulation period. First, we define a rate of return (RK) as a ratio between a price of capital (PK) and user costs (UK) to approximate the Tobin's Q (Eq.12). We label the production sectors by *c* and time periods by *t*.

$$RK_{c,t} = PK_{c,t}/UK_{c,t} \qquad \text{Eq.12}$$

The price of capital (PK) is then pinned down by an optimal allocation of production factors by standard and inclusive producers. This definition of the return to capital is set in line with Křístková (2010) and differs from the original specification with a net operating surplus. On the other hand, the user costs (UK) consist of a capital depreciation rate (δ) as a real cost of the capital usage and a real interest rate (ι) as an opportunity cost of the capital investment (Eq.13). The user costs are further adjusted by an investment price index (IP) that captures an average price of investment in the economy.

$$UK_{c,t} = \delta_c * IP_t + \iota_c * IP_t \qquad \text{Eq.13}$$

The allocation of investment (ID) relative to a capital stock (KT) in standard and inclusive sectors is then a function of the rate of return (RK), in line with an investment theory of the Tobin's Q (Eq.14). The rate of return above one then means that the production sector will attract new investment, since a future profit from a unit of capital exceeds its user costs. The elasticity of substitution σ_k is set to 2.50, in line with the model of Křístková (2010). Finally, since a total amount of investment is pinned down by the savings to investment identity, we need to recalibrate the allocation of investment in order to achieve a balance between the demand for investment and the supply of investment.

$$ID_{c,t} = \varepsilon_c * KT_{c,t} * RK_{c,t}^{\sigma_k} \qquad \text{Eq.14}$$

4.8 Constant subventions

We assume that the government controls for the number of activation workers and inclusive employees in each simulation period by subventions on active labour market policies. Therefore, we could calibrate the subventions per person from a benchmark period, fix them as constant on a simulation horizon and thus determine the number of activation workers and inclusive employees in each simulation period. On the other hand, we could argue that

an inelastic relationship between the number of participants and the subventions per person is questionable, since an incentive of both producers and households to participate in active labour market policies could decline with a degree of social exclusion and thus with the number of participants.[12] In line with this assumption, we need to incorporate a negative relationship between the number of participants in each simulation period and their incentive to participate in active labour market policies.

4.9 Subvention functions

The labour income per person (Λ) should be then defined as an increasing function of the number of inclusive employees (IN) to further motivate more excluded persons to participate in the inclusive programmes. We choose a linear functional form (Eq.15) for convenience and a lack of additional information about socially excluded communities but the application of other increasing functional forms is also possible. Calibration of the parameters is based on the number of inclusive employees in a benchmark period and an additional assumption about a minimal labour income that results from the subventions per person. Specifically, we set the number of inclusive employees to zero if the labour income per person is less than an official minimum wage.

$$\Lambda_t = \eta_1 + \eta_2 * \mathrm{IN}_t \qquad \text{Eq.15}$$

The activation transfer per person (Υ) should be also defined as an increasing function of the number of activation workers (AN) to further motivate more excluded persons to participate in the activation works. Again, we choose a linear functional form (Eq.16) for convenience and a lack of additional information. Calibration of the parameters is based on the number of activation workers in a benchmark period and an additional assumption about a maximal activation transfer that results from the subventions per person. Specifically, we set the number of activation workers to maximum if the activation transfer per person is more than an official subsistence minimum.

$$\Upsilon_t = \tau_1 + \tau_2 * \mathrm{AN}_t \qquad \text{Eq.16}$$

[12] We assume that an increase in the number of participants in active labour market policies should result in an increase in a degree of social exclusion of the last participant. In other words, the least excluded persons should be the first ones to participate in active labour market policies and the opposite should hold for the most excluded persons. We thus apply a marginal approach to identify a degree of social exclusion of the participants in active labour market policies.

4.10 Definition of prices

We distinguish between different types of prices in the model specification. We start with the labour costs of employees (PE) that are pinned down by the first order conditions of inclusive employers (Eq.3) or social enterprises (Eq.4) and a perfect mobility of labour of standard employees. The price of labour (PL) and the price of capital (PK) are then implied by the first order conditions of the Cobb-Douglas function (Eq.6). Furthermore, we obtain the price components of value added (PA) and intermediate consumption (PC) from the zero-profit assumptions of the Leontief function (Eq.7) and the Constant elasticity of substitution function (Eq.8) in the production chain.

On the other hand, the price components of domestic production (PY) and domestic sales (PD) are pinned down by the zero-profit assumptions of the Armington functions of transformation (Eq.10) and substitution (Eq.11). The export prices (PX) and the import prices (PM) are then implied by external world prices (PW) and a nominal exchange rate (ER) that are set exogenous to the model. We conclude with the prices of particular commodities (PQ) that are pinned down by the first order conditions of the Stone-Geary function (Eq.9) and our choice of the model numeraire. Specifically, we choose a consumer price index (CP) as the model numeraire and thus pin down an average price of commodities in the domestic economy.[13] The model prices are set to unity in a benchmark period and further evaluated with a respect to the model numeraire.

4.11 Clearing of markets

Model closure is based on a constant depreciation rate for both production sectors and a constant savings rate for both types of households. We thus assume that the agents in the economy maintain their preferences over time. External world prices and a nominal exchange rate are further set exogenous to the model what comes as natural in a small open economy of the Slovak Republic. Savings of firms are then implied by budgetary restrictions of firms and a current account is pinned down by budgetary restrictions of the external world. On the other hand, we need to exogenize public consumption (GT) to estimate dynamic effects of active labour market policies on fiscal variables. Savings of government are then implied by budgetary restrictions of government and further define

[13] Common price indices are regularly chosen as model numeraires to avoid issues with microeconomic closures. For further information about alternative choices of model numeraires see Ezaki (2006).

a public sector deficit and a public sector debt. Finally, we exogenize domestic inventories (VT) and thus obtain domestic investment (IT) from total savings in the economy, in line with the Walras's law. Distribution of the domestic investment between standard and inclusive commodities is then based on a Leontief functional form (Eq.17) and is thus fixed in constant proportions. We further label the standard commodities by *s*, the inclusive commodities by *i* and time periods by *t*.

$$\mathrm{IT_t} = 1/\mu_s * \mathrm{IT_{s,t}} = 1/\mu_i * \mathrm{IT_{i,t}} \qquad \text{Eq.17}$$

Next, we exogenize the number of standard and inclusive employees in each simulation period and thus close the labour market. Distribution of the standard employees between both production sectors is then implied by a perfect mobility of labour. On the other hand, a total amount of the inclusive employees on the labour market is set by the government. We further exogenize a capital stock in both production sectors in each simulation period and thus close the capital market. Finally, we close the commodity market by a market clearing condition for standard and inclusive commodities (Eq.18). We further label the sectoral commodities by *c*, the standard producers by *s*, the inclusive producers by *i*, the standard households by *s*, the excluded households by *e* and time periods by *t*.

$$\mathrm{QT_{c,t}} = \mathrm{IC_{s,c,t}} + \mathrm{IC_{i,c,t}} + \mathrm{CT_{s,c,t}} + \mathrm{CT_{e,c,t}} + \mathrm{GT_{c,t}} + \mathrm{IT_{c,t}} + \mathrm{VT_{c,t}} \qquad \text{Eq.18}$$

4.12 Labour dynamization

Dynamization of the model is implied by additional equations for labour and capital production factors. Specifically, we exogenize these variables in each simulation period by corresponding dynamic equations and thus provide a microeconomic closure to the model. First, we determine the domestic employment (DE) by a mobility function of activation workers and inclusive employees (Eq.19). We thus assume that an actual value of the domestic employment is equal to a previous value of the domestic employment and a share of activation workers (AN) and inclusive employees (IN) from a previous simulation period that are able to find a work position in an actual simulation period. On the other hand, we assume that once the activation workers or the inclusive employees find a work position, they become the standard employees and do not return to the activation works nor the inclusive programmes. We thus do not define a mobility function of standard employees, only a mobility function of activation workers and inclusive employees.

$$\mathrm{DE_{t+1}} = \mathrm{DE_t} + \Sigma_t * \mathrm{AN_t} + \Gamma_t * \mathrm{IN_t} \qquad \text{Eq.19}$$

In a baseline scenario, we calibrate the mobility of activation workers (Σ) and inclusive employees (Γ) from a historical dataset, fix it as constant on a simulation horizon and thus determine the domestic employment in each simulation period.[14] Specifically, we identify an average share of activation workers and inclusive employees in an actual year that are able to find a work position in a next year with a respect to a control group that does not participate in active labour market policies. While the activation works provide a small improvement (2%) over the control group of socially excluded communities, the inclusive programmes significantly improve (12%) the prospects of the participants to find a work position in a next simulation period.

While we could satisfy with the partial equilibrium results that are implied by the calibration of the mobility function and its impact on the labour market, we propose a more complex approach to its evaluation that is consistent with a theory of general equilibrium and thus incorporate (i) structural relationships in the Slovak economy, (ii) a different productivity of standard and inclusive employees, (iii) a different structure of standard and inclusive producers, (iv) different consumption habits of standard and excluded households and (v) dynamic effects of active labour market policies on domestic producers and households.

4.13 The social dumping

However, we could argue that since the subventions per person for inclusive employers depend on the number of participants in inclusive programmes and could thus vary over time, we need to incorporate an additional relationship between the subventions per person and the mobility of inclusive employees. For example, it could be more profitable for the inclusive employers to participate in the inclusive programmes with additional subventions from government than offer a regular job to the inclusive employees. This could be viewed as a form of social dumping that should be positively correlated with the subventions per person. An increase in the subventions per person should thus lead to a decline in the mobility of inclusive employees, due to an increase of the social dumping. We thus incorporate a negative relationship between the mobility of inclusive employees (Γ) and the subventions per person (Π) in each simulation period (Eq.20).

$$\Gamma_t = \lambda_1 - \lambda_2 * \Pi_t \qquad \text{Eq.20}$$

[14] The historical mobility of activation workers and inclusive employees is obtained from the individual microeconomic data of the Institute for Financial Policy (IFP).

Again, we choose a linear functional form for convenience and a lack of additional information but the application of other decreasing functional forms is also possible. Calibration of the parameters is then based on the subventions per person in a benchmark period and an additional assumption about a maximal labour income that results from the subventions per person. Specifically, we set the mobility of inclusive employees to zero if the labour income of employees is more than an official mean wage. Next, the subventions per person (Π) are equal to a simple difference between the labour income per person (Λ) and the labour costs per person (PE) in each simulation period (Eq.21).

$$\Pi_t = \Lambda_t - PE_{i,t} \qquad \text{Eq.21}$$

On the other hand, since the social enterprises do not aim to maximize their profits from production, we assume that the mobility of inclusive employees should be independent from the subventions per person and thus constant in each simulation period. The social enterprises should thus have a more positive impact on the domestic employment than the inclusive employers if we incorporate the social dumping into the model.

4.14 Capital dynamization

Next, we determine the capital stock in the standard sector (SK) by an accumulation function of standard capital (Eq.22). An actual value of the capital stock is thus equal to a previous value of the capital stock that is adjusted for a capital depreciation rate (δ) and a share of domestic investment (IT) from a previous simulation period. The share of investment (Ω) is equal to a ratio between the allocation of investment in the standard sector and a sum of investment allocations in both production sectors. To unify the model notation, we need to write $KT_{s,t} = SK_t$ for the capital factor of standard producers.

$$SK_{t+1} = (1 - \delta_s) * SK_t + \Omega_{s,t} * IT_t \qquad \text{Eq.22}$$

Finally, we determine the capital stock in the inclusive sector (IK) by an accumulation function of inclusive capital (Eq.23). The share of investment (Ω) is equal to a ratio between the allocation of investment in the inclusive sector and a sum of investment allocations in both production sectors. To unify the model notation, we need to write $KT_{i,t} = IK_t$ for the capital factor of inclusive producers.

$$IK_{t+1} = (1 - \delta_i) * IK_t + \Omega_{i,t} * IT_t \qquad \text{Eq.23}$$

5 Data and calibration

Calibration of the model parameters is based on a social accounting matrix (SAM) that incorporates structural relationships between macroeconomic variables in a benchmark period (2016). Specifically, the matrix captures nominal flows in the economy to describe production and consumption of different types of commodities and intersectoral transfers between households, firms, government and external world. Furthermore, we disaggregate the matrix for standard and inclusive commodities, standard and inclusive producers and standard and excluded households to model an impact of active labour market policies on an economic performance of the Slovak Republic.

Construction of the matrix is based on two basic assumptions. First, the principle of input-output tables states that expenditures of one economic subject are compensated as revenues of another economic subject. Second, the principle of national accounts states that total incomes and total expenditures of an economic subject are equal to each other. Social accounting matrix is thus a square matrix with a sum of rows equal to a sum of columns, where the matrix rows correspond to the incomes of an economic subject and the matrix columns correspond to the expenditures of an economic subject. The matrix further distinguishes between blocks of commodities (standard and inclusive), activities (standard and inclusive), factors (labour and capital), taxation (domestic and import), households (standard and excluded), institutions (firms and government), subventions (activation and inclusive), savings (investment and inventories) and the external world.

5.1 Macroeconomic data

Calibration of the social accounting matrix is based on national and sectoral accounts of the Statistical Office of the Slovak Republic (Table 1). The national accounts provide information about production and consumption of different types of commodities. On the other hand, the sectoral accounts describe nominal flows between households, firms, government and external world. We then observe that the labour factor accounts for 50.4% and the capital factor accounts for 49.5% of a gross value added in a benchmark period. The gross value added further accounts for 38.1% and intermediate inputs account for 61.9% of domestic production. On the other hand, private consumption explains 54.6% and public consumption explains 19.4% of a gross domestic product in a benchmark period. A share of investment on output is then equal to 21.3% and a share of inventories on output is equal to 1.7%. Furthermore, a trade to output ratio is equal to 3.0%.

Calibration of the labour market and the capital market is further based on the national accounts of the Statistical Office of the Slovak Republic (Table 1). We thus observe that an unemployment rate is equal to 9.6% and a participation rate is equal to 60.0% in a benchmark period. On the other hand, calibration of the fiscal variables is based on government finance statistics of the Eurostat (Table 1). A deficit to output ratio is thus equal to 2.9% and a debt to output ratio is equal to 51.8% in a benchmark period.

5.2 Types of households

Decomposition of a national population into standard and excluded households is implied by a database of excluded communities that is obtained from the Institute for Financial Policy (IFP). The database is based on individual microeconomic data and a set of social and economic characteristics from the Atlas of Roma communities (2013), for further information see Hidas et al. (2018). We are thus able to identify the excluded communities on an individual level and further link them with other administrative data to approximate a structure of the domestic labour market, calibrate subventions on active labour market policies and identify components of budgetary restrictions of households.

We then distinguish between different types of active labour market policies with a focus on the activation works and the inclusive programmes. Specifically, we include activation transfers for activation and voluntary services, to capture subventions for households in exchange of small manual jobs for regions or municipalities, and wage subsidies on private and regional employment, to capture subventions for employers in exchange of offering work positions to socially excluded communities.[15] We then merge the database of active labour market policies with the database of excluded communities to identify the number of activation workers and the number of inclusive employees in a benchmark period (Table 3). We observe that 14.5% of the excluded population participates in the activation works and that 5.7% of the excluded population participates in the inclusive programmes. Furthermore, we are able to identify subventions for the activation works and the inclusive programmes in a benchmark period (Table 3).

[15] We include the activation works with a respect to the paragraph §52 and the inclusive programmes with a respect to the paragraphs §50 and §54 of the Act on Employment Services. A brief definition of these paragraphs is provided in the Appendix. For the original version of the act see https://ec.europa.eu/migrant-integration/library-document/act-no-52004-employment-services_en. For the current version of the act see https://www.slov-lex.sk/static/pdf/2004/5/ZZ_2004_5_20220401.pdf.

Next, we merge the database of excluded communities with the database of labour market participants to identify a share of activation workers and inclusive employees that are able to find a work position in a next simulation period (Table 3). We then observe that the activation works improve the prospects of the participants by 2.3% and the inclusive programmes improve the prospects of the participants by 11.7%. Furthermore, we can see that 29.9% of the non-participants are searching for a job on the labour market and 70.1% of the non-participants are set outside the labour market. Finally, we merge the database of excluded communities with the database of social benefits to identify social transfers of both types of households. Furthermore, since we assume that the capital factors and the other transfers are relevant only for the standard households and not for the excluded households, we are able to identify a disposable income of both types of households in a benchmark period (Table 2). The budgetary restrictions then imply a decomposition of private consumption between both types of households.[16]

5.3 Types of producers

Decomposition of total production between standard and inclusive producers is based on a database of domestic firms from the Institute for Financial Policy (IFP). Specifically, we merge the database of domestic firms with the database of active labour market policies and thus identify the domestic producers that participate in the inclusive programmes in a form of inclusive employers. We are then able to determine the production chain of both types of producers and thus decompose the domestic production between both production sectors (Table 2). We further assume that the production taxes are distributed in fixed proportions between both types of producers.

Next, we extract labour costs of standard and inclusive employees and thus approximate a labour productivity of both types of employment (Table 2). Furthermore, we can see that 39.4% of the inclusive programmes are paid by government in a form of wage subsidies for employers and 60.6% of the inclusive programmes are paid by producers in a form of labour costs of employees. We further assume that the labour income taxes are distributed in fixed proportions between both types of employees. Finally, since we assume that the total mixed surplus is relevant only for the standard producers and not for the

[16] The activation transfers for the excluded communities are a part of the social transfers of the excluded households. On the other hand, the wage subsidies for the excluded communities are a part of the subsidies on production of the inclusive producers.

inclusive producers, we can determine the operating surplus of both types of producers. The heterogeneity of standard and inclusive producers is consistent with the findings of Bredgaard and Halkjaer (2016) that the firms participating in active labour market policies are characterized by a high number of unskilled workers, a strong coverage of collective agreements, a deteriorating economic situation and a domestic ownership structure.

In the case of social enterprises, we calibrate the number of inclusive managers from the number of inclusive employees in a benchmark period. We can then identify the labour costs of standard and inclusive producers from the labour costs per person and a perfect mobility of labour of inclusive managers.[17] Furthermore, we assume that the shares of labour and capital factors in the social enterprises are the same as in the inclusive employers and thus identify value added in both production sectors. Finally, we assume that the shares of value added and intermediate inputs in the social enterprises are the same as in the inclusive employers and thus identify total production in both production sectors.

5.4 Types of commodities

Distribution of standard and inclusive commodities between intermediate inputs, private consumption, public consumption, domestic investment, domestic inventories and export of commodities is based on a sectoral decomposition of standard and inclusive producers. Specifically, we decompose the total production in both production sectors into subsectors of agriculture, industries, construction and services and then distribute the production in the subsectors between the consumption components in fixed shares that are obtained from an input-output table (2015). For example, since the inclusive producers are significantly biased towards the sector of manufacturing, the distribution of the inclusive commodities should be positively biased towards export of commodities and negatively biased towards private and public consumption. We further assume that the consumption taxes are distributed in fixed proportions between both types of commodities.

5.5 Calibration matrix

The block of commodities explains (i) the consumption of commodities (Row 1) by the block of activities (intermediate inputs), the block of households (private consumption), the block of government (public consumption), the block of investment (domestic investment), the block of inventories (domestic inventories) and the external world (export

[17] We model the inclusive managers as the standard employees.

of commodities) and (ii) the production of commodities (Column 1) from the block of activities (domestic production), the external world (import of commodities), the domestic taxation (consumption taxes) and the import taxation (total import taxes). On the other hand, the block of activities explains (i) the transformation of activities (Row 2) into the block commodities (domestic production) and (ii) the decomposition of activities (Column 2) into the block commodities (intermediate inputs), the labour factor (total labour costs), the capital factor (domestic surplus) and the domestic taxation (production taxes).[18] The blocks of commodities and activities should be further based on the same components of sectoral disaggregation. In the model specification, we distinguish between standard and inclusive commodities and standard and inclusive producers.[19]

The labour factor is pinned down (Row 3) by the block of activities (total labour costs) and the external world (labour cost balance) and is further distributed (Column 3) to the block of households (total compensations). On the other hand, the capital factor is pinned down (Row 4) by the block of activities (domestic surplus) and is further distributed (Column 4) between the block of firms (operating surplus), the block of households (total mixed surplus) and the block of investment (capital depreciation). The domestic taxation is then based (Row 5) on the blocks of commodities (consumption taxes) and activities (production taxes) and the blocks of households (labour income taxes) and firms (total capital taxes) and is further distributed (Column 5) between the blocks of government (public sector taxes) and firms (private labour taxes). On the other hand, we need to transfer the import taxation (total import taxes) from the block of commodities (Row 6) to the block government (Column 6).

The revenues of households (Row 7) are pinned down by the labour factor (total compensations), the capital factor (total mixed surplus), the block of firms (transfers of households), the block of government (total social transfers) and the external world (balance of households). The expenditures of households (Column 7) are further distributed between the block of commodities (private consumption), the block of investment (savings of households) and the domestic taxation (labour income taxes). On the other hand, the revenues of firms (Row 8) are pinned down by the capital factor (operating surplus), the external world (balance of firms) and the domestic taxation

[18] The consumption taxes correspond to taxes minus subsidies on consumption and the production taxes correspond to taxes minus subsidies on production.

[19] We refer to rows and columns of a basic calibration matrix that is provided in the Appendix.

(private labour taxes). The expenditures of firms (Column 8) are further distributed between the block of households (transfers of households), the block of government (transfers of government), the block of investment (savings of firms) and the domestic taxation (total capital taxes). The revenues of government (Row 9) are then pinned down by the domestic taxation (public sector taxes), the import taxation (total import taxes), the block of firms (transfers of government) and the external world (balance of government). The expenditures of government (Column 9) are further distributed between the block of commodities (public consumption), the block of households (total social transfers) and the block of investment (savings of government).

The formation of investment (Row 10) is further implied by the capital factor (capital depreciation), the block of households (savings of households), the block of firms (savings of firms), the block of government (savings of government) and the external world (current account). On the other hand, the consumption of investment (Column 10) is implied by the block of commodities (domestic investment) and the block of inventories (domestic inventories). Finally, we need to transfer the block of inventories (domestic inventories) from the block of investment (Row 11) to the block commodities (Column 11).

5.6 Matrix decomposition

The model disaggregation is based on a decomposition of (i) the block of commodities into standard and inclusive commodities, (ii) the block of activities into standard and inclusive producers and (iii) the block of households into standard and excluded households under a set of model assumptions. First, we assume that the inclusive producers obtain subventions from the government in exchange of offering work positions to excluded communities and thus need to incorporate both standard and inclusive employees. On the other hand, the standard producers incorporate only the standard employees. Second, we assume that the inclusive commodities result from the inclusive producers and that the standard commodities result from the standard producers and import of commodities.

Third, we assume that the excluded households consume their entire income and that only the standard households contribute to total savings in the economy and thus to domestic investment. We further assume that the excluded households do not borrow from the standard households on financial markets and thus set their consumption equal to their income. Fourth, we assume that the revenues of the excluded households consist of labour factors and social transfers and that the revenues of the standard households consist

of labour and capital factors and social and other transfers.[20] Fifth, we assume that only a part of the excluded communities participates in the activation works and the inclusive programmes. The activation workers and the inclusive employees then obtain the same social transfers and share the same spending habits as the rest of the excluded communities. Furthermore, the activation workers obtain an additional activation transfer and the inclusive employees obtain an additional labour income. Finally, we assume that the activation transfers for the excluded communities are a part of the social transfers of the excluded households and that the wage subsidies for the excluded communities are a part of the subsidies on production of the inclusive producers.

5.7 Intersectoral transfers

The intersectoral transfers between firms, households, government and external world are based on primary and secondary distributions of revenues and expenditures from sectoral national accounts. Specifically, we construct a matrix of intersectoral transfers (MIT) that captures individual transfers between the economic subjects to capture a distribution of social and pension transfers, taxes and contributions, dividends and rents, interest rates, public subventions and external investment. While the most of the intersectoral transfers are paid between two economic subjects and can be thus directly marked in the matrix, the rest of the intersectoral transfers needs to be proportionally distributed between all economic subjects, due to a lack of additional information. It is important to note that the matrix incorporates only net intersectoral transfers that are obtained as a sum of revenues minus a sum of expenditures of one economic subject from/to another economic subject.

5.8 Output elasticities

Estimation of the elasticity of substitution σ_p is based on a theory of profit maximization and corresponding first order conditions, in line with Okagawa and Ban (2008). We thus identify real and price components of value added and intermediate consumption from national accounts and then estimate a logarithmic ratio of the first order conditions (Eq.24). We assume that a ratio between the price components of value added (PA) and intermediate consumption (PC) is a function of a ratio between the real components of value added (VA) and intermediate consumption (IC) that depends on the elasticity of substitution σ_p and the

[20] The other transfers further consist of the transfers of households from the domestic firms and the balance of households with the external world.

mean factor effectivity β_e in the Slovak economy. We further link the constant parameter in the equation Δ_p to the mean factor effectivity β_e with a transformation function $\Delta_p = \log(\beta_e) - \log(1 - \beta_e)$. It is important to note that the price components of the production factors are identified as ratios between corresponding variables in current prices and chain linked volumes and thus as price deflators. The real components of the production factors are obtained in chain linked volumes.

$$\log (PA_t/PC_t) = \Delta_p + 1/\sigma_p * \log (IC_t/VA_t) \qquad \text{Eq.24}$$

The estimation procedure is based on the Ordinary Least Squares (OLS) and performed on quarterly data from the first quarter of 1995 to the last quarter of 2016. The estimated value of the elasticity of substitution σ_p is equal to 2.75, thus rejecting the unit substitution between value added and intermediate consumption in the Slovak economy. These results are consistent with related literature, see for example McDonald et al. (2005).

5.9 International trade

Estimation of the elasticity of substitution σ_m and the elasticity of transformation σ_x is based on a system of linear equations that are derived from first order conditions, in line with Gallaway et al. (2003). The import prices (PM) and the export prices (PX) are identified as ratios between corresponding variables in current prices and chain linked volumes and thus as import and export deflators. The import prices are further adjusted for taxes on import to identify financial costs of domestic consumers. On the other hand, the domestic prices (PD) are identified by the producer price index. Domestic sales (DT) are then equal to a difference between domestic production (YT) and export of commodities (XT) that is further equal to a difference between domestic consumption (QT) and import of commodities (MT) adjusted for taxes and subsidies.

5.10 Trade elasticities

We then estimate a logarithmic ratio of the first order conditions for domestic sales and export of commodities (Eq.25). We assume that a ratio between the price components of domestic exports (PX) and domestic sales (PD) is a function of a ratio between the real components of domestic exports (XT) and domestic sales (DT) that relies on the elasticity of transformation σ_x and the mean export effectivity ξ_e in the Slovak economy. We further link the constant parameter in the equation Δ_x to the mean export effectivity ξ_e with a transformation function $\Delta_x = \log(\xi_e) - \log(1 - \xi_e)$.

$$\log (PX_t/PD_t) = \Delta_x + 1/\sigma_x * \log (DT_t/XT_t) \quad \text{Eq.25}$$

Finally, we estimate a logarithmic ratio of the first order conditions for domestic sales and import of commodities (Eq.26). We assume that a ratio between the price components of domestic imports (PM) and domestic sales (PD) is a function of a ratio between the real components of domestic imports (MT) and domestic sales (DT) that relies on the elasticity of substitution σ_m and the mean import effectivity ζ_e in the Slovak economy. We further link the constant parameter in the equation Δ_m to the mean import effectivity ζ_e with a transformation function $\Delta_m = \log(\zeta_e) - \log(1 - \zeta_e)$.

$$\log (PM_t/PD_t) = \Delta_m + 1/\sigma_m * \log (DT_t/MT_t) \quad \text{Eq.26}$$

The estimation procedure is based on the Ordinary Least Squares (OLS) and performed on quarterly data from the first quarter of 1995 to the last quarter of 2016. However, due to a limited availability of the quarterly data, we need to solve multiple issues with frequency and seasonality to obtain consistent underlying dataset. Specifically, due to an absence of quarterly data on taxes and subsidies, we need to estimate these time series from annual data with a corresponding benchmark on taxes on products by (i) application of the Denton Cholette method to obtain an initial disaggregation of the annual series and (ii) controlling for a sum of quarterly series by the Multivariate Denton method. On the other hand, the quarterly series are seasonally adjusted by the X13 Arima Seats method and then benchmarked on the annual series by the Chow Lin Maxlog method.

The estimation results are in line with related literature, with the elasticity of substitution σ_m equal to 3.89 and the elasticity of transformation σ_x equal to 3.98. According to the results of Hertel et al. (2007), the substitution elasticities between different external sources range from 1.80 to 34.40. The application of a standard rule of thumb then implies that the substitution elasticities between domestic and external sources range from 0.90 to 17.20. On the other hand, the results of Gallaway et al. (2003) imply that the substitution elasticities between domestic and external sources should range from 1.00 to 5.00. Finally, the transformation elasticities should range from 3.00 to 7.00, according to the summary of Hillberry and Hummels (2012). The estimation results for the Slovak Republic are thus well within a standard estimation range, implying a high substitutability and a high transformability between domestic and external sources. To check for the model robustness, we estimate the trade elasticities also from annual data and compare the estimation results with the quarterly estimates. Both elasticities are in line with the original estimates.

Finally, we compare the estimation results with an empirical paper of Imbs and Mejean (2010) that estimates the trade elasticities across different countries with the popular method of Feenstra (1994). The estimated values of the elasticity of substitution for the Slovak Republic range from 1.98 to 3.19. On the other hand, the estimated values of the elasticity of transformation for the Slovak Republic range from 0.91 to 3.80. Even though we estimate slightly higher elasticities, we argue that the results of Imbs and Mejean (2010) could be biased downwards due to historical estimation weights that may not be actual in the recent years. Furthermore, the trade elasticities for the Slovak Republic are estimated on a lower threshold of the estimation range of Imbs and Mejean (2010).

6 Results and discussion

To evaluate the potential impact of active labour market policies on the Slovak economy, we assume that the government provides the full support for either the activation works or the inclusive programmes to achieve the maximal participation of excluded communities in each simulation period. In other words, we set the number of excluded persons that do not participate in active labour market policies to zero and then distribute them either to the activation works or the inclusive programmes. We need to mention that to evaluate current labour market policies, we focus on the inclusive programmes in the form of inclusive employers and not in the form of social enterprises.

The baseline scenario is set under an absence of active labour market policies and since we leave other parameters of the model unchanged, we can evaluate a potential impact of the alternative policies on an economic performance. The model closure then implies that a public sector deficit and a public sector debt in the baseline scenario should be milder than in a benchmark period. The first set of scenarios evaluate a potential impact of the activation works on the Slovak economy under constant and linear relationships between the number of activation workers and the activation transfer per person. The second set of scenarios then evaluate a potential impact of the inclusive programmes on the Slovak economy under constant and linear relationships between the number of inclusive employees and the labour income per person.[21] The simulation results for a gross domestic product and domestic employment are presented in the Figure 1. The contributions of particular components to a gross domestic product are presented in the Figure 2.

Furthermore, we simulate an alternative scenario where we place the activation workers from a benchmark period to the inclusive programmes by cutting the activation transfers to zero and then supporting the inclusive programmes in each simulation period. We thus evaluate an empirical impact of a policy shift from the activation works to the inclusive programmes on macroeconomic and fiscal variables. Finally, to evaluate the potential impact of different types of inclusive programmes on the Slovak economy, we assume that the government provides the full support for either the inclusive employers or the social enterprises in each simulation period. We thus set the number of excluded persons that do not participate in the inclusive programmes to zero and then place them on the inclusive

[21] We thus simulate four different scenarios to evaluate a potential impact of active labour market policies on an economic performance of the Slovak Republic.

labour market in a form of inclusive employers or social enterprises. We further assume a linear relationship between the number of inclusive employees and the labour income per person to be able to distinguish between simulation scenarios with and without the social dumping.[22] The simulation results without social dumping are presented in the Figure 3 and the simulation results with social dumping are presented in the Figure 4.

The evaluation of the alternative scenarios is based on a 10-years simulation horizon. We further present a cumulative impact of the alternative scenarios on gross domestic product, private consumption, domestic investment, trade balance, domestic employment, excluded population, households income, rate of unemployment, rate of participation, public sector deficit and public sector debt. Since we abstract from loans between standard and excluded households, we observe that the private consumption evolves in a similar manner as the households income. The results are presented with a respect to the baseline scenario under an absence of active labour market policies.[23]

Furthermore, we need to mention that we abstract from a number of positive effects that result from the employment of socially excluded communities, for example the reduction of generational poverty, the improvement of living standards or the provision of better education. We partially incorporate their higher qualification on the labour market by a higher productivity of the standard employees over the inclusive employees. Active labour market policies could be thus viewed as a form of social investment rather than a form of social transfer. Finally, since these factors could lead to additional gains for the economy, the simulation results should be viewed as the minimal profit from the employment of socially excluded communities.

6.1 Activation works

Full support for the activation works leads to a marginal improvement of the economic performance (Table 4). The gross domestic product and the private consumption increase by 0.3% and the domestic employment raises by 0.6%. Furthermore, the unemployment rate and the participation rate improve by 0.2 p.p. at the end of the simulation horizon. Even though it may seem a little counterintuitive that the employment improves more than the unemployment, this is driven by the fact that only a part of the excluded population

[22] The constant relationship between the number of inclusive employees and the labour income per person would in fact mean the absence of the social dumping.

[23] The model simulations are performed in the Matlab software.

searches for a job on the labour market. Finally, the number of excluded persons declines by more than 20% at the end of the simulation horizon. Even though these results indicate a small improvement over the baseline scenario, they stay in contrast to the conclusions of Harvan (2011) that the activation works create an inferior situation on the labour market with negative implications for future prospects of their participants.

If we consider a linear relationship between the number of participants and the subventions per person, the gross domestic product improves by less than 0.2% and the private consumption raises by more than 0.4% (Table 5). These differences are driven by more expensive subventions on the activation works with a positive impact on the private consumption and a negative impact on the domestic investment (Figure 2). The simulation results are further consistent with the findings of Brown and Koettl (2015) that even though the activation works are not very effective in terms of labour market outcomes, they can be beneficial for a reduction of poverty and inequalities.

6.2 Inclusive programmes

Full support for the inclusive programmes leads to more favourable results in terms of structural unemployment and potential production (Table 6). The gross domestic product improves by 1.5%, while the private consumption raises by 1.2% and the domestic investment increases by 3.6% at the end of the simulation horizon. We thus observe a strong contribution of the domestic investment to the gross domestic product what is driven by the fact that the elimination of social exclusion creates new opportunities for savings of households and improves the access to mortgage loans. Furthermore, the stronger domestic demand raises corporate profits and improves fiscal variables. On the other hand, we observe only a marginal impact of the inclusive programmes on the trade balance (Figure 2). The domestic employment improves by 2.0% and the number of excluded persons declines by more than 70%. Finally, the rate of unemployment declines by 0.6 p.p. and the rate of participation raises by 0.7 p.p. at the end of the simulation horizon.

If we consider a linear relationship between the number of participants and the subventions per person, the gross domestic product improves by 1.3%, while the private consumption raises by 1.1% and the domestic investment increases by 3.0% (Table 7). The contribution of the domestic investment is limited by more expensive subventions on the inclusive programmes and thus lower savings in the economy. On the other hand, the contribution of the private consumption is boosted by a disposable income of households. The simulation

results thus support the conclusions of Páleník et al. (2013) that the inclusive programmes could reduce structural unemployment and thus improve potential production in the Slovak economy. The positive impact of the inclusive programmes on the excluded communities is further consistent with the findings of Escudero (2018) that the inclusive programmes could improve labour market prospects of low-skilled participants.

6.3 Subvention transfers

After the evaluation of the potential effects of the alternative policies, we could ask how profitable it would be to transfer the subventions from the activation works to the inclusive programmes. We thus simulate an alternative scenario where we place the activation workers from a benchmark period to the inclusive programmes by cutting the activation transfers to zero and then supporting the inclusive programmes in each simulation period. For simplicity, we assume a constant relationship between the number of activation workers and the activation transfer per person and a constant relationship between the number of inclusive employees and the labour income per person (Table 8). However, the linear relationship between the number of participants and the subventions per person does not significantly change the results (Table 9).

This policy shift improves the gross domestic product by 0.3% and raises the private consumption by 0.2%. Furthermore, the domestic employment raises by 0.4% and the number of excluded persons declines by more than 15%. Finally, the unemployment rate and the participation rate improve by more than 0.1 p.p. at the end of the simulation horizon. It is important to note that even though the subventions for the inclusive programmes are more expensive than the subventions for the activation works, we observe a positive impact of this policy shift on fiscal variables. The deficit to output ratio improves by 0.1 p.p. and the debt to output ratio declines by 0.7 p.p. at the end of the simulation horizon. The inclusive programmes are thus more efficient than the activation works not only from a macroeconomic perspective but also from a cost-benefit point of view.

6.4 Inclusive labour market

As was already discussed, an application of inclusive employers without social dumping could improve the domestic employment by 2.0% and enhance the gross domestic product by 1.3% at the end of the simulation horizon (Table 10). Furthermore, the inclusive programmes could reduce the number of excluded persons by more than 70%. The rate of

unemployment then declines by 0.6 p.p. and the rate of participation raises by 0.7 p.p. at the end of the simulation horizon. The private consumption raises by 1.1% and the domestic investment increases by 3.0%. On the other hand, we observe only a marginal impact of the inclusive programmes on the trade balance. Finally, even though the application of inclusive employers elevates the public sector deficit by 0.3 p.p. in the first period, the stronger economic performance decreases the public sector debt by 1.4 p.p. at the end of the simulation horizon. The application of inclusive employers is thus efficient not only from a macroeconomic perspective but also from a cost-benefit point of view.

On the other hand, the social dumping of inclusive employers limits the positive impact of inclusive programmes on the economic performance. Specifically, the domestic employment improves by 1.6% and the gross domestic product enhances by 1.0% at the end of the simulation horizon (Table 11). The social dumping further materializes in a lower mobility of inclusive employees, since the number of excluded persons declines by less than 60%. Furthermore, the rate of unemployment declines by 0.5 p.p. and the rate of participation raises by 0.6 p.p. at the end of the simulation horizon.

An application of social enterprises without social dumping has even less pronounced impact on the gross domestic product that improves by less than 0.7% at the end of the simulation horizon (Table 12). While the private consumption raises by more than 0.9%, the domestic investment is limited by a worse fiscal position of government and increases by less than 0.8%. On the other hand, the domestic employment improves by 2.0% and the number of excluded persons declines by more than 70%. The application of social enterprises further elevates the public sector deficit by 0.8 p.p. in the first period and increases the public sector debt by 2.0 p.p. at the end of the simulation horizon. Finally, since the social enterprises do not aim to maximize their profits from production, we abstract from the social dumping of social enterprises.

The simulation results are consistent with the findings of Vooren et al. (2018) that both public employment in the social enterprises, and wage subsidies to the inclusive employers have a positive impact on an economic performance in a medium horizon. Furthermore, the inclusive employers have a more positive impact on an economic performance than the social enterprises, in line with a higher productivity of domestic producers and a stronger formation of domestic capital. On the other hand, the social enterprises have a more positive impact on the domestic labour market than the inclusive employers if we incorporate the social dumping into the model simulations.

6.5 Sensitivity analysis

Next, we present a sensitivity analysis for a functional ratio between the number of inclusive employees and the number of inclusive managers in the social enterprises and its impact on the economic performance. In the baseline scenario, we assume that one inclusive manager is necessary for the employment of four inclusive employees. We then simulate a number of alternative scenarios where we variate this parameter and observe its impact on the economic performance at the end of the simulation horizon. The simulation results of the sensitivity analysis are presented in the Figure 5.

In general, if one inclusive manager can operate more inclusive employees, we observe a milder crowding out of the labour factor from more effective production sectors what improves the economic performance. However, these differences decline with the scale and are thus much more relevant for a high number of inclusive managers. For example, if we need to apply one inclusive manager per one inclusive employee, we obtain a negative impact of social enterprises on the economic performance, in contrast to a positive impact in the baseline scenario. On the other hand, these differences are relatively small between the applications of one inclusive manager per four and ten inclusive employees. A variation of this parameter has a limited impact on the private consumption but has a significant impact on the domestic investment, in line with a fiscal position of government. Our results are thus relatively robust to alternative values of the functional ratio between the number of inclusive employees and the number of inclusive managers.

6.6 Evaluation methods

Finally, we could be interested in quantitative differences between partial and general equilibrium evaluation methods. While an evolution of the labour factor is driven by a mobility function of activation workers and inclusive employees and could be thus evaluated by the partial equilibrium methods, an evolution of the capital factor is driven by an accumulation function of a capital stock that results from the general equilibrium methods. On the other hand, while an evolution of private consumption is implied by budgetary restrictions of households and could be thus approximated by the partial equilibrium methods, an evolution of domestic investment is implied by market clearing conditions that result from the general equilibrium methods. As we can see, the quantitative differences between these approaches could be thus relatively small for the activation works but rather significant for the inclusive programmes (Figure 2).

6.7 Further extensions

There are also some further extensions of our thesis. First, we could extend the block of inclusive producers for a set of inclusive employers and social enterprises that further compete on the inclusive labour market for inclusive employees. This model extension should result in a number of positive implications for socially excluded communities and domestic government, for example (i) an increase in labour income from the inclusive employers, (ii) an improvement of working conditions in the social enterprises and (iii) a decline in subventions on active labour market policies. However, this model extension could be problematic, due to a lack of available information about the inclusive employers and an absence of available information about the social enterprises.

Second, we could incorporate active labour market policies as fixed term contracts that could not be prolonged in a next simulation period. We would thus limit the incentives of the inclusive producers to excess the social dumping and improve the motivation of the excluded communities to find a work position in a next simulation period. On the other hand, we need to ensure that the excluded persons would not participate in active labour market policies in two consecutive periods. This could be then achieved by an additional assumption that only a half of the excluded persons could participate in the activation works or the inclusive programmes in each simulation period.

Third, we could extend the budgetary restrictions for loans between standard and excluded households and thus assume a higher savings rate of the standard households and a negative savings rate of the excluded households. This would further result in a different structure of a gross domestic product after the integration of the excluded communities. Specifically, we could expect a decline in private consumption and an increase in domestic investment, due to an improvement of total savings in the economy. However, we abstract from this extension, due to a lack of available information.

Finally, we could assume that even after the excluded persons find a work position and thus in fact become the standard employees, they could still return to the activation works or the inclusive programmes. We would thus need to define a mobility function of standard employees that would be consistent with the mobility function of activation workers and inclusive employees. However, we abstract from this extension, since we suppose that the number of standard employees that are once again hit by a social exclusion should be negligible in the context of model simulations.

7 Concluding remarks

In this article, we outlined negative implications of social exclusion on a formation of generational poverty and structural unemployment and proposed a potential solution in a form of active labour market policies. Next, we identified the communities that suffer from social exclusion and structural unemployment and described different types of active labour market policies that support their integration to the labour market, with a focus on the activation works and the inclusive programmes. Furthermore, we outlined two forms of the inclusive labour market that operates on a basis of inclusive employers or social enterprises. We then proposed a computable general equilibrium model of a small open economy with two types of producers and two types of households to compare the alternative policies and evaluate their potential impact on the economic performance. Finally, we provided dynamization of the model by an accumulation function of a capital stock and a mobility function of activation workers and inclusive employees.

The simulation results show that the inclusive programmes provide much better results than the activation works in terms of structural unemployment and potential production. These results are in line with a historical mobility of activation workers and inclusive employees that is obtained from individual microeconomic data, but provide a more complex view of the economic implications of the alternative policies. In contrast to the activation works, the inclusive programmes have a positive impact not only on a disposable income of households but also on a capital formation in the economy.

These results are robust to an alternative specification of the mobility function that is based on a linear relationship between the number of participants and the subventions per person to motivate more excluded persons to participate in active labour market policies. Furthermore, we suggest that a policy shift from the activation works to the inclusive programmes not only reduces structural unemployment and improves potential production but also results in more sustainable fiscal variables. This is driven by a fact that additional tax revenues more than compensate more expensive subventions.

The simulation results further show that the application of inclusive employers leads to a better improvement of a gross domestic product, in line with a higher productivity of domestic producers and a stronger formation of domestic capital. However, the social dumping of inclusive employers could limit the mobility of inclusive employees and thus the employment of the excluded communities. Contrary to this, the application of social

enterprises provides better labour market prospects for the excluded communities, in line with the absence of social dumping. However, the domestic production could be limited by a worse fiscal position of government and a crowding out of the labour factor from more effective production sectors. The sensitivity analysis implies that a high number of inclusive managers in social enterprises may further limit the economic performance.

Even though we provided a case study for the Slovak Republic, the model can be easily adopted for other countries or regions. Furthermore, the model can be extended for other types of active labour market policies, for example job search assistance, graduate practises or training programmes, and other forms of labour market imperfections, for example regional or youth unemployment.

Data and materials

The macroeconomic data that were analysed during the current study are available in the repository of the Statistical Office of the Slovak Republic. The data are subject to revision: http://datacube.statistics.sk/#!/view/en/VBD_SK_WIN/nu1028rs/v_nu1028rs_00_00_00_en

The labour market data that were analysed during the current study are available in the repository of the Statistical Office of the Slovak Republic. The data are subject to revision: http://datacube.statistics.sk/#!/view/en/VBD_SK_WIN/nu1024rs/v_nu1024rs_00_00_00_en

The capital market data that were analysed during the current study are available in the repository of the Statistical Office of the Slovak Republic. The data are subject to revision: http://datacube.statistics.sk/#!/view/en/VBD_SLOVSTAT/nu2061rs/v_nu2061rs_00_00_00_en

The fiscal sector data that were analysed during the current study are available in the repository of the Eurostat of the European Commission. The data are subject to revision: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10dd_edpt1&lang=en

The microeconomic data that were analysed during the current study are available from the Institute for Financial Policy but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. These data are however available upon a reasonable request and with a permission of the Institute for Financial Policy.

Paragraph definition

§52: Contribution for Activation Activity

For the purposes of this Act, activation activity is defined as the support of maintaining the working habits of the job seeker. Activation activity shall be executed in the duration of at least 10 hours per week and 40 hours per month, except for the month in which the activation activity began. Activation activity may be performed in the form of minor communal services performed for a municipality and organised by the latter, or of voluntary works organised by a legal person or by a natural person.

§50: Contribution for Employing a Disadvantaged Job Seeker

The contribution for employing a disadvantaged job seeker who has been registered in the register of job seekers for the specified duration may be granted to the employer employing the disadvantaged job seeker in a generated job (hereinafter referred to as contribution). The contribution shall be provided in monthly intervals, covering up to 100 % of the price of work per disadvantaged job seeker accepted by the employer in a generated job, but not exceeding the amount of the total price of labour calculated from the average gross monthly wage of an employee in the Slovak Republic's economy for the previous calendar year. No contribution shall be granted for employing a disadvantaged job seeker who is a disabled citizen and for whose employing was granted a contribution.

§54: Projects and Programmes

Projects and programmes designed to improve the employment situation development in the territorial boundaries of the Office in the framework of partnerships, approved by the Committee and realised by partnerships established for the purpose, such projects and programmes may be co-financed from the state budget upon approval by the Ministry. Projects and programmes in support of the development of regional employment, approved by the Committee and realised by the Office, which may be co-financed from the state budget. Projects and programmes for supporting the growth of regional employment and increasing employability, financed from the state budget, which are approved by the Ministry and implemented by the Social Development Fund.

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Tables and figures

Gross domestic product	81 226.073	**Private consumption**	44 372.371
Public consumption	15 739.218	**Domestic investment**	17 279.938
Domestic inventories	1 386.353	**Trade balance**	2 448.193
Domestic production	192 583.981	**Intermediate inputs**	119 147.786
Gross value added	73 436.195	**Total labour factor**	36 986.501
Total capital factor	36 386.714	**Production taxes**	62.980
Domestic employment	2 321.049	**Migration balance**	171.069
Total unemployment	265.996	**Total inactive persons**	1 836.095
Public sector deficit	2 320.207	**Public sector debt**	42 053.200

Table 1: Aggregate macroeconomic variables in a benchmark period (2016). Domestic employment, migration balance, total unemployment and total inactive persons are provided in thousands of persons. Gross domestic product, private consumption, public consumption, domestic investment, domestic inventories, trade balance, domestic production, intermediate inputs, gross value added, total labour factor, total capital factor, production taxes, public sector deficit and public sector debt are provided in millions of euro.

Standard population	4 528.133	**Excluded population**	66.076
Standard income	45 615.289	**Excluded income**	109.337
Standard production	189 138.540	**Inclusive production**	3 445.441
Standard labour costs	36 960.784	**Inclusive labour costs**	25.717

Table 2: Sectoral macroeconomic variables in a benchmark period (2016). Standard population and excluded population are provided in thousands of persons. Standard income, excluded income, standard production, inclusive production, standard labour costs and inclusive labour costs are provided in millions of euro.

Activation workers	9.609	**Inclusive employees**	3.752
Activation subventions	8.224	**Inclusive subventions**	10.135
Successful workers	0.217	**Successful employees**	0.440
Total unemployment	15.762	**Total inactive persons**	36.953

Table 3: Active labour market policies in a benchmark period (2016). Activation workers, inclusive employees, successful workers, successful employees, total unemployment and total inactive persons are provided in thousands of persons. Activation subventions and inclusive subventions are provided in millions of euro.

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.00	0.02	0.05	0.08	0.11	0.14	0.17	0.20	0.23	0.27
Private consumption	0.13	0.15	0.17	0.19	0.21	0.23	0.26	0.28	0.30	0.33
Domestic investment	-0.33	-0.26	-0.19	-0.12	-0.05	0.03	0.11	0.20	0.29	0.38
Trade balance (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic employment	0.06	0.13	0.19	0.25	0.31	0.37	0.42	0.48	0.53	0.59
Excluded population	-2.26	-4.48	-6.64	-8.75	-10.8	-12.8	-14.8	-16.7	-18.6	-20.5
Households income	0.12	0.14	0.17	0.19	0.21	0.23	0.25	0.28	0.30	0.33
Rate of unemployment	-0.02	-0.04	-0.06	-0.08	-0.10	-0.11	-0.13	-0.15	-0.16	-0.18
Rate of participation	0.02	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21
Public balance (% GDP)	-0.07	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0.01	0.02	0.03
Public debt (% GDP)	0.07	0.12	0.15	0.17	0.18	0.18	0.16	0.13	0.09	0.04

Table 4: A potential impact of the activation works on the Slovak economy under a constant transformation function. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario under an absence of active labour market policies.

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.00	0.01	0.02	0.04	0.05	0.07	0.09	0.11	0.13	0.15
Private consumption	0.35	0.36	0.36	0.36	0.37	0.38	0.38	0.39	0.40	0.41
Domestic investment	-0.91	-0.86	-0.80	-0.74	-0.68	-0.61	-0.54	-0.47	-0.39	-0.32
Trade balance (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
Domestic employment	0.06	0.13	0.19	0.25	0.31	0.37	0.42	0.48	0.53	0.59
Excluded population	-2.26	-4.48	-6.64	-8.75	-10.8	-12.8	-14.8	-16.7	-18.6	-20.5
Households income	0.34	0.35	0.35	0.35	0.36	0.37	0.38	0.38	0.39	0.41
Rate of unemployment	-0.02	-0.04	-0.06	-0.08	-0.10	-0.11	-0.13	-0.15	-0.16	-0.18
Rate of participation	0.02	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21
Public balance (% GDP)	-0.19	-0.18	-0.17	-0.16	-0.14	-0.13	-0.12	-0.11	-0.09	-0.08
Public debt (% GDP)	0.19	0.37	0.53	0.68	0.81	0.93	1.03	1.12	1.19	1.25

Table 5: A potential impact of the activation works on the Slovak economy under a linear transformation function. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario under an absence of active labour market policies.

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.37	0.51	0.64	0.77	0.89	1.01	1.12	1.24	1.35	1.46
Private consumption	0.48	0.57	0.66	0.74	0.82	0.89	0.96	1.03	1.10	1.17
Domestic investment	0.50	0.89	1.27	1.62	1.97	2.31	2.64	2.96	3.28	3.59
Trade balance (% GDP)	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Domestic employment	0.34	0.63	0.89	1.12	1.33	1.51	1.67	1.81	1.93	2.04
Excluded population	-11.7	-22.1	-31.2	-39.3	-46.4	-52.7	-58.2	-63.1	-67.5	-71.3
Households income	0.46	0.55	0.64	0.73	0.81	0.88	0.96	1.03	1.10	1.17
Rate of unemployment	-0.10	-0.19	-0.27	-0.35	-0.41	-0.46	-0.51	-0.55	-0.59	-0.62
Rate of participation	0.12	0.22	0.31	0.40	0.47	0.53	0.59	0.64	0.68	0.72
Public balance (% GDP)	0.00	0.06	0.11	0.16	0.21	0.25	0.29	0.33	0.37	0.41
Public debt (% GDP)	-0.19	-0.32	-0.51	-0.74	-1.02	-1.35	-1.72	-2.12	-2.57	-3.05

Table 6: A potential impact of the inclusive programmes on the Slovak economy under a constant transformation function. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario under an absence of active labour market policies.

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.37	0.48	0.58	0.68	0.79	0.89	0.99	1.09	1.20	1.30
Private consumption	1.05	0.99	0.96	0.96	0.96	0.98	1.01	1.05	1.09	1.14
Domestic investment	-0.96	-0.34	0.21	0.70	1.15	1.56	1.94	2.30	2.65	2.98
Trade balance (% GDP)	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Domestic employment	0.34	0.63	0.89	1.12	1.33	1.51	1.67	1.81	1.93	2.04
Excluded population	-11.7	-22.1	-31.2	-39.3	-46.4	-52.7	-58.2	-63.1	-67.5	-71.3
Households income	1.01	0.96	0.94	0.94	0.95	0.97	1.00	1.04	1.09	1.13
Rate of unemployment	-0.10	-0.19	-0.27	-0.35	-0.41	-0.46	-0.51	-0.55	-0.59	-0.62
Rate of participation	0.12	0.22	0.31	0.40	0.47	0.53	0.59	0.64	0.68	0.72
Public balance (% GDP)	-0.32	-0.20	-0.10	-0.01	0.07	0.13	0.19	0.25	0.29	0.34
Public debt (% GDP)	0.13	0.27	0.31	0.25	0.12	-0.08	-0.34	-0.66	-1.02	-1.43

Table 7: A potential impact of the inclusive programmes on the Slovak economy under a linear transformation function. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario under an absence of active labour market policies.

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.05	0.08	0.10	0.13	0.15	0.18	0.21	0.24	0.27	0.30
Private consumption	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.22	0.24
Domestic investment	0.12	0.18	0.24	0.30	0.37	0.44	0.52	0.59	0.68	0.76
Trade balance (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic employment	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.31	0.35	0.39
Excluded population	-1.39	-2.81	-4.26	-5.73	-7.24	-8.78	-10.4	-12.0	-13.6	-15.3
Households income	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.24
Rate of unemployment	-0.01	-0.02	-0.04	-0.05	-0.06	-0.07	-0.08	-0.10	-0.11	-0.12
Rate of participation	0.01	0.03	0.04	0.06	0.07	0.08	0.10	0.11	0.12	0.14
Public balance (% GDP)	0.01	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
Public debt (% GDP)	-0.04	-0.07	-0.11	-0.15	-0.21	-0.28	-0.36	-0.44	-0.54	-0.65

Table 8: Macroeconomic implications of a policy shift from the activation works to the inclusive programmes under a constant transformation function. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario from a benchmark period (2016).

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.05	0.08	0.10	0.12	0.15	0.17	0.20	0.23	0.26	0.29
Private consumption	0.07	0.09	0.10	0.12	0.14	0.16	0.18	0.21	0.23	0.25
Domestic investment	0.08	0.13	0.19	0.25	0.31	0.38	0.45	0.53	0.60	0.69
Trade balance (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domestic employment	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.31	0.35	0.39
Excluded population	-1.39	-2.81	-4.26	-5.73	-7.24	-8.78	-10.4	-12.0	-13.6	-15.3
Households income	0.07	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.23	0.25
Rate of unemployment	-0.01	-0.02	-0.04	-0.05	-0.06	-0.07	-0.08	-0.10	-0.11	-0.12
Rate of participation	0.01	0.03	0.04	0.06	0.07	0.08	0.10	0.11	0.12	0.14
Public balance (% GDP)	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07
Public debt (% GDP)	-0.03	-0.05	-0.07	-0.11	-0.16	-0.21	-0.28	-0.35	-0.44	-0.54

Table 9: Macroeconomic implications of a policy shift from the activation works to the inclusive programmes under a linear transformation function. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario from a benchmark period (2016).

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.37	0.48	0.58	0.68	0.79	0.89	0.99	1.09	1.20	1.30
Private consumption	1.05	0.99	0.96	0.96	0.96	0.98	1.01	1.05	1.09	1.14
Domestic investment	-0.96	-0.34	0.21	0.70	1.15	1.56	1.94	2.30	2.65	2.98
Trade balance (% GDP)	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Domestic employment	0.34	0.63	0.89	1.12	1.33	1.51	1.67	1.81	1.93	2.04
Excluded population	-11.7	-22.1	-31.2	-39.3	-46.4	-52.7	-58.2	-63.1	-67.5	-71.3
Households income	1.01	0.96	0.94	0.94	0.95	0.97	1.00	1.04	1.09	1.13
Rate of unemployment	-0.10	-0.19	-0.27	-0.35	-0.41	-0.46	-0.51	-0.55	-0.59	-0.62
Rate of participation	0.12	0.22	0.31	0.40	0.47	0.53	0.59	0.64	0.68	0.72
Public balance (% GDP)	-0.32	-0.20	-0.10	-0.01	0.07	0.13	0.19	0.25	0.29	0.34
Public debt (% GDP)	0.13	0.27	0.31	0.25	0.12	-0.08	-0.34	-0.66	-1.02	-1.43

Table 10: A potential impact of the application of inclusive employers without social dumping on the Slovak economy. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario under an absence of active labour market policies.

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	0.37	0.42	0.48	0.54	0.60	0.68	0.76	0.84	0.93	1.02
Private consumption	1.05	1.01	0.98	0.96	0.95	0.95	0.96	0.98	1.00	1.03
Domestic investment	-0.96	-0.64	-0.31	0.03	0.36	0.69	1.03	1.36	1.68	2.00
Trade balance (% GDP)	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Domestic employment	0.19	0.37	0.55	0.73	0.90	1.06	1.22	1.37	1.50	1.63
Excluded population	-6.55	-13.0	-19.3	-25.5	-31.4	-37.1	-42.6	-47.7	-52.5	-57.0
Households income	1.01	0.97	0.95	0.93	0.93	0.93	0.94	0.96	0.99	1.02
Rate of unemployment	-0.06	-0.11	-0.17	-0.22	-0.28	-0.33	-0.37	-0.42	-0.46	-0.50
Rate of participation	0.07	0.13	0.20	0.26	0.32	0.37	0.43	0.48	0.53	0.57
Public balance (% GDP)	-0.32	-0.25	-0.19	-0.13	-0.07	-0.01	0.05	0.10	0.15	0.20
Public debt (% GDP)	0.13	0.35	0.51	0.60	0.62	0.58	0.48	0.32	0.10	-0.16

Table 11: A potential impact of the application of inclusive employers with social dumping on the Slovak economy. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario under an absence of active labour market policies.

	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y
Gross domestic product	-0.03	0.08	0.14	0.21	0.27	0.34	0.42	0.49	0.57	0.66
Private consumption	1.44	1.27	1.15	1.06	1.00	0.96	0.94	0.93	0.93	0.94
Domestic investment	-4.59	-4.01	-3.23	-2.52	-1.86	-1.26	-0.70	-0.19	0.30	0.75
Trade balance (% GDP)	0.16	0.24	0.20	0.16	0.12	0.08	0.05	0.02	-0.01	-0.04
Domestic employment	0.34	0.63	0.89	1.12	1.33	1.51	1.67	1.81	1.93	2.04
Excluded population	-11.7	-22.1	-31.2	-39.3	-46.4	-52.7	-58.2	-63.1	-67.5	-71.3
Households income	1.40	1.23	1.12	1.03	0.98	0.94	0.92	0.92	0.92	0.93
Rate of unemployment	-0.10	-0.19	-0.27	-0.35	-0.41	-0.46	-0.51	-0.55	-0.59	-0.62
Rate of participation	0.12	0.22	0.31	0.40	0.47	0.53	0.59	0.64	0.68	0.72
Public balance (% GDP)	-0.79	-0.58	-0.44	-0.33	-0.24	-0.15	-0.08	-0.02	0.04	0.09
Public debt (% GDP)	0.81	1.32	1.73	2.02	2.20	2.31	2.33	2.29	2.19	2.02

Table 12: A potential impact of the application of social enterprises without social dumping on the Slovak economy. Trade balance, rate of unemployment, rate of participation, public sector balance and public sector debt are provided in percentage points over the baseline scenario. Other macroeconomic variables are provided in per cents over the baseline scenario. We define the baseline scenario under an absence of active labour market policies.

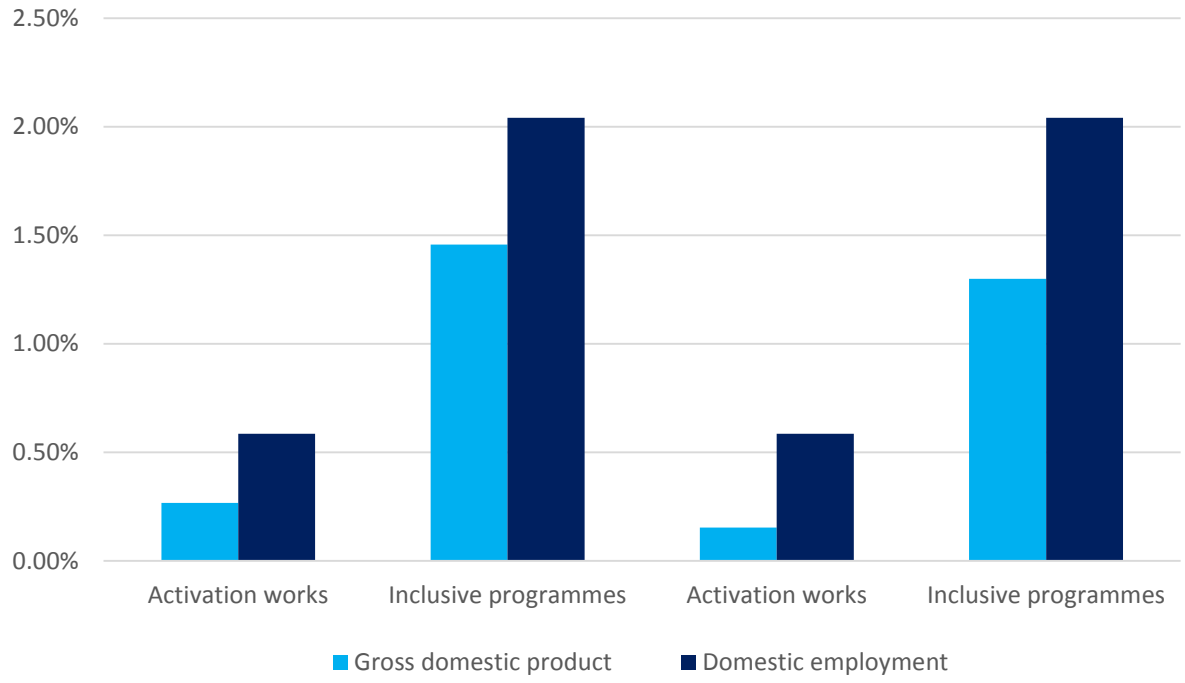

Figure 1: A potential impact of different types of active labour market policies on a gross domestic product and domestic employment on a 10-years simulation horizon. The model specification is based either on a constant relationship (left figures) or a linear relationship (right figures) between the number of participants and the subventions per person.

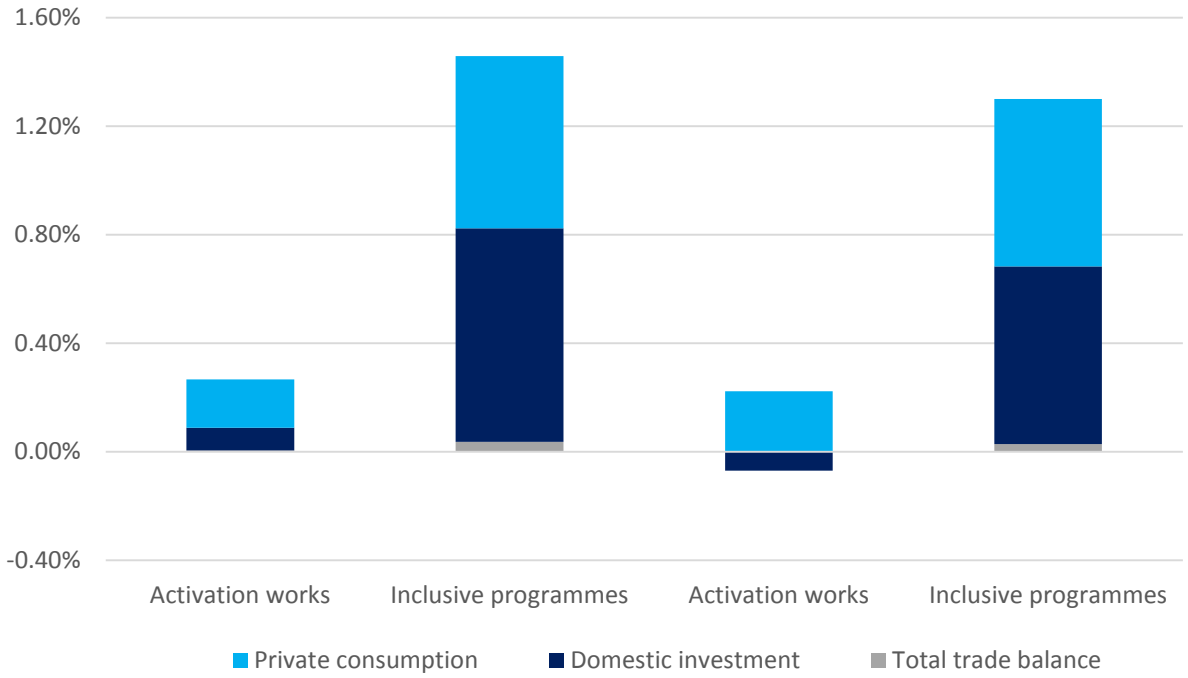

Figure 2: Contributions of expenditure components to a gross domestic product on a 10-years simulation horizon for different types of active labour market policies. The model specification is based either on a constant relationship (left figures) or a linear relationship (right figures) between the number of participants and the subventions per person.

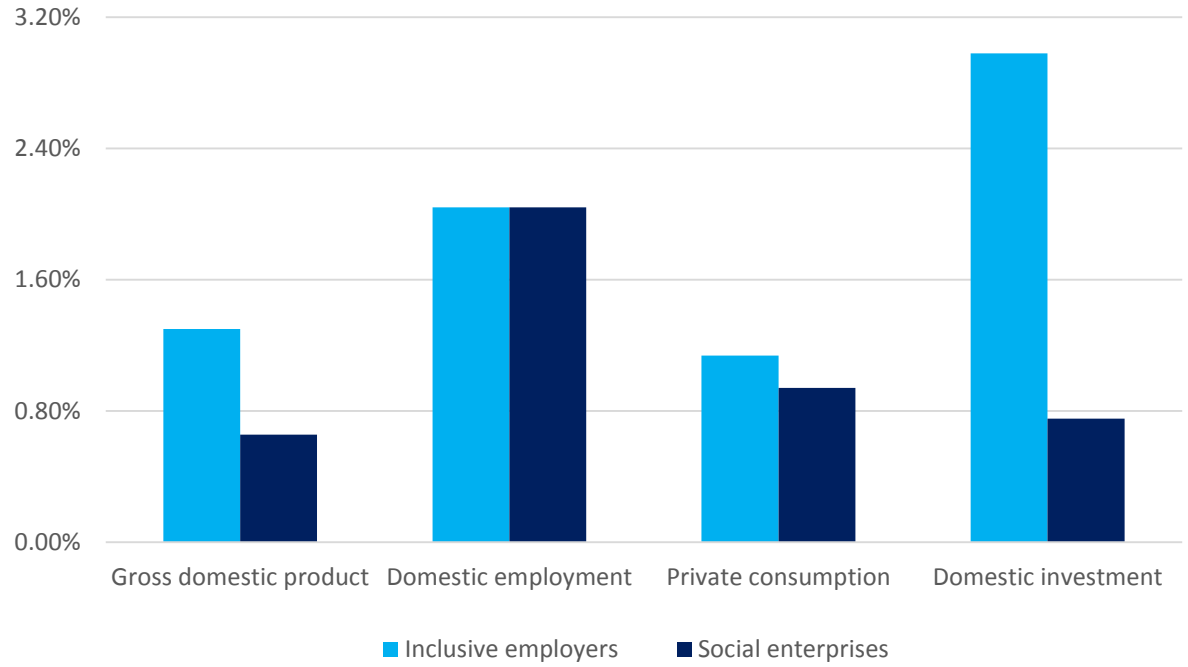

Figure 3: A potential impact of the application of different types of inclusive programmes on the Slovak economy on a 10-years simulation horizon. The model specification is based on a linear relationship between the number of participants and the subventions per person. The simulation results are presented for the scenarios without social dumping.

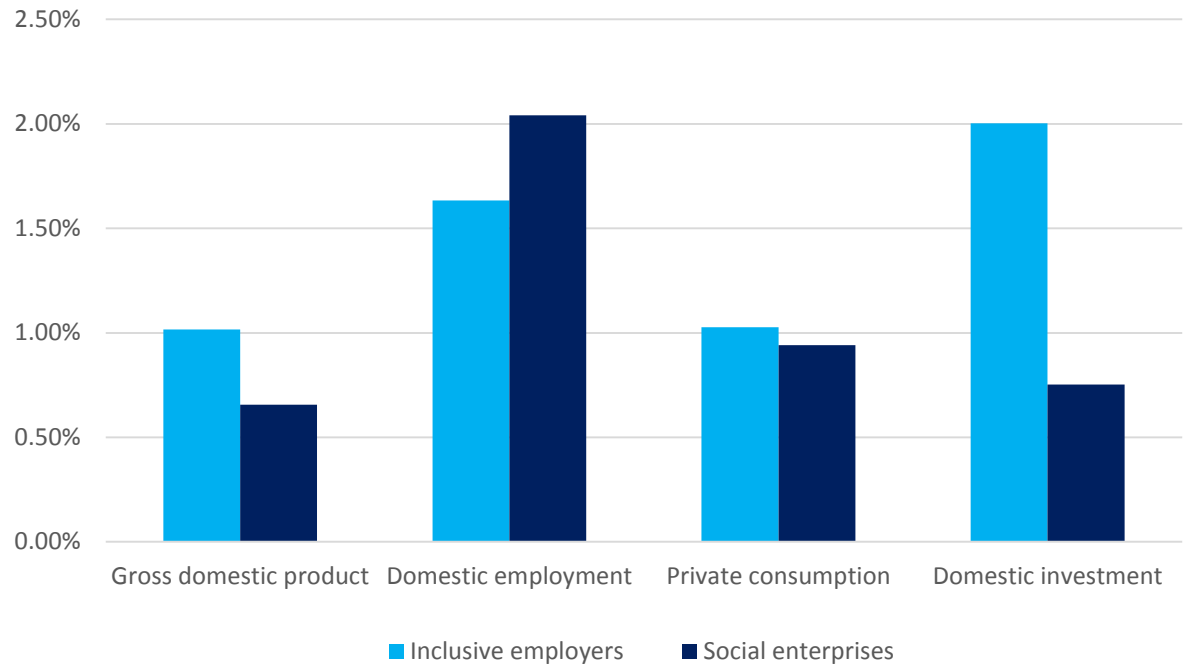

Figure 4: A potential impact of the application of different types of inclusive programmes on the Slovak economy on a 10-years simulation horizon. The model specification is based on a linear relationship between the number of participants and the subventions per person. The simulation results are presented for the scenarios with social dumping.

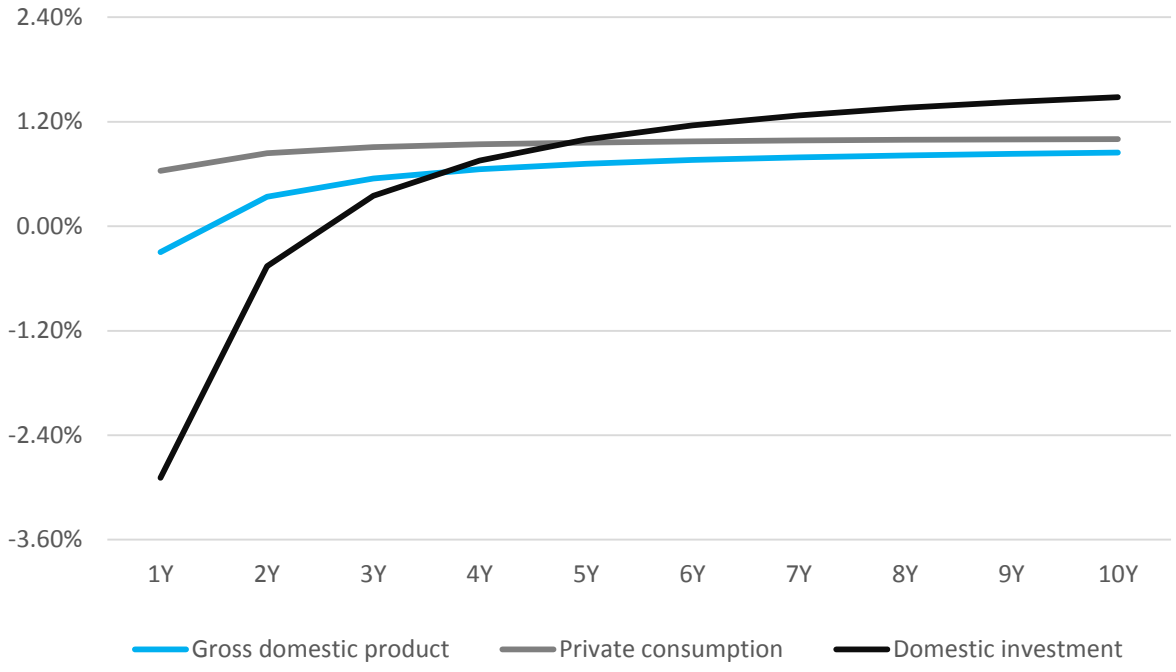

Figure 5: A sensitivity analysis for a functional ratio between the number of inclusive employees and the number of inclusive managers in the social enterprises and its impact on the Slovak economy on a 10-years simulation horizon. The model specification is based on a linear relationship between the number of participants and the subventions per person.

Basic calibration matrix

	Block of commodities	Block of activities	Labour factors	Capital factors	Domestic taxation
Block of commodities		119 147.786			
Block of activities	192 583.981				
Labour factors		36 986.501			
Capital factors		36 386.714			
Domestic taxation	7 665.951	62.980			
Import taxation	123.927				
Block of households			38 295.758	10 208.408	
Block of firms				10 038.197	663.797
Block of government					22 526.460
Block of investment				16 140.109	
Block of inventories					
External world	73 501.042				

Import taxation	Block of households	Block of firms	Block of government	Block of investment	Block of inventories	External world
	44 372.371		15 739.218	17 279.938	1 386.353	75 949.235
						1 309.257
	12 755.618	2 705.708				
		1 209.348	8 763.833			2.898
123.927		13.915				
	1 352.255	2 532.661	-2 320.207			961.473
				1 386.353		
		4 240.362	481.459			

Model calibration matrix

	Standard commodities	Inclusive commodities	Standard activities	Inclusive activities	Labour factors	Capital factors	Domestic taxation
Standard commodities			115 239.409	2 412.383			
Inclusive commodities			1 465.319	30.675			
Standard activities	189 138.540						
Inclusive activities		3 445.441					
Labour factors			36 216.705	769.796			
Capital factors			36 144.990	241.724			
Domestic taxation	7 575.100	90.851	72.117	0.998			
Import taxation	123.927						
Standard households					38 270.041	10 208.408	
Excluded households					25.717		
Block of firms						10 038.197	663.797
Block of government							22 536.595
Activation subventions							
Inclusive subventions				-10.135			
Block of investment						16 140.109	
Block of inventories							
External world	73 501.042						

Import taxation	Standard households	Excluded households	Block of firms	Block of government	Activation subventions	Inclusive subventions	Block of investment	Block of inventories	External world
	43 754.282	108.080		15 646.349			17 060.534	1 358.960	74 758.612
	508.752	1.257		92.869			219.404	27.393	1 190.623
									1 309.257
	12 746.749	8.869	2 705.708						
			1 209.348	8 671.344					2.898
				84.265	8.224				
123.927			13.915			-10.135			
				8.224					
	1 352.255		2 532.661	-2 320.207					961.473
							1 386.353		
			4 240.362	481.459					

Model parametrization

	Notation	Value	Notation	Value
Labour market subventions	Υ_t	0.8559	Λ_t	6.8542
Labour income per person	η_1	4.2601	η_2	0.0614
Activation transfer per person	τ_1	0.5970	τ_2	0.0269
Mobility on labour market	Σ_t	0.0226	Γ_t	0.1173
Mobility with social dumping	λ_1	0.1411	λ_2	0.0088
Share of excluded population	χ_u	0.2990	χ_i	0.7010

Table 13: Calibration of labour market parameters in a baseline scenario. Parameters Υ_t and Λ_t are applied only for a constant transformation function between the number of participants and the subventions per person. Parameters Σ_t and Γ_t are applied only for a model specification without social dumping of inclusive employers.

	Notation	Value	Notation	Value
Total factor effectivity	ψ_s	2.5579	ψ_i	6.8425
Relative factor effectivity	φ_s	0.5005	φ_i	0.7586
Input of inclusive employers	κ_s	1.0586	κ_i	0.2745
Input of social enterprises	π_s	0.2000	π_i	0.8000
Total output effectivity	α_s	1.9797	α_i	1.9324
Relative output effectivity	β_s	0.4568	β_i	0.4198
Share of intermediate inputs	ω_s	0.9874	ω_i	0.0126

Table 14: Calibration of production sector parameters in a baseline scenario. Calibration of these parameters is based on a social accounting matrix in a benchmark period and an initial distribution of standard and inclusive employees.

	Notation	Value	Notation	Value
Necessary consumption value	ρ_s	0.4482	ρ_i	0.0052
Social transfers per person	o_s	1.9150	o_e	1.2753
Additional consumption share	γ_s	0.9885	γ_i	0.0115
Savings rate of households	ς_s	0.0296	ς_e	0.0000

Table 15: Calibration of household sector parameters in a baseline scenario. Calibration of these parameters is based on a social accounting matrix in a benchmark period and an initial distribution of standard and excluded population.

	Notation	Value	Notation	Value
Total export effectivity	υ_s	2.0113	υ_i	2.0254
Relative export effectivity	ξ_s	0.5267	ξ_i	0.5400
Total import effectivity	ν_s	2.0694	ν_i	1.0403
Relative import effectivity	ζ_s	0.4720	ζ_i	0.0000

Table 16: Calibration of trade sector parameters in a baseline scenario. Calibration of these parameters is based on a social accounting matrix in a benchmark period.

	Notation	Value	Notation	Value
Domestic investment share	μ_s	0.9873	μ_i	0.0127
Capital depreciation rate	δ_s	0.0448	δ_i	0.0448
Sectoral investment value	ε_s	0.0103	ε_i	0.0341
Effective interest rate	ι_s	0.0100	ι_i	0.0100

Table 17: Calibration of capital market parameters in a baseline scenario. Calibration of these parameters is based on a social accounting matrix in a benchmark period and an initial distribution of standard and inclusive capital stock.

	Notation	Value	Notation	Value
Domestic output elasticity	σ_p	2.7520	θ_p	0.6366
Domestic export elasticity	σ_x	3.9831	θ_x	1.2511
Domestic import elasticity	σ_m	3.8854	θ_m	0.7426
Domestic capital elasticity	σ_k	2.5000	θ_k	0.6000

Table 18: Calibration of macroeconomic elasticities in a baseline scenario. Calibration of these parameters is based on an econometric estimation of first order conditions and related literature on substitution and transformation elasticities.

List of model equations

Labour market equations

$$AS_t = \Upsilon_t * AN_t \quad \text{(Eq.A01)}$$

$$IS_t = \Lambda_t * IN_t - PE_{i,t} * IN_t \quad \text{(Eq.A02)}$$

$$\Pi_t = \Lambda_t - PE_{i,t} \quad \text{(Eq.A03)}$$

$$SP_{t+1} = SP_t + \Sigma_t * AN_t + \Gamma_t * IN_t \quad \text{(Eq.A04)}$$

$$NE_t = SP_t - SU_t - SI_t \quad \text{(Eq.A05)}$$

$$EP_{t+1} = EP_t - \Sigma_t * AN_t - \Gamma_t * IN_t \quad \text{(Eq.A06)}$$

$$DE_t = NE_t - MB_t \quad \text{(Eq.A07)}$$

$$NU_t = SU_t + \chi_u * EP_t \quad \text{(Eq.A08)}$$

$$\Psi_t = NU_t/(NE_t + NU_t) \quad \text{(Eq.A09)}$$

$$NI_t = SI_t + \chi_i * EP_t \quad \text{(Eq.A10)}$$

$$\Phi_t = (NE_t + NU_t)/(NE_t + NU_t + NI_t) \quad \text{(Eq.A11)}$$

Inclusive employer equations

$$LE_{i,t} = IN_t \quad \text{(Eq.A12)}$$

$$LT_{i,t} * PL_{i,t} = LE_{s,t} * PE_{s,t} + LE_{i,t} * PE_{i,t} \quad \text{(Eq.A13)}$$

$$PE_{s,t} = PL_{s,t} \quad \text{(Eq.A14)}$$

$$1/\kappa_s * PE_{s,t} = 1/\kappa_i * PE_{i,t} \quad \text{(Eq.A15)}$$

$$LT_{s,t} = DE_t - LE_{s,t} \quad \text{(Eq.A16)}$$

$$KT_{s,t} = SK_t \quad \text{(Eq.A17)}$$

$$LT_{i,t} = \kappa_s * LE_{s,t} + \kappa_i * LE_{i,t} \quad \text{(Eq.A18)}$$

$$KT_{i,t} = IK_t \quad \text{(Eq.A19)}$$

Social enterprise equations

$$LE_{i,t} = IN_t \quad \text{(Eq.A20)}$$

$$LT_{i,t} * PL_{i,t} = LE_{s,t} * PE_{s,t} + LE_{i,t} * PE_{i,t} \quad \text{(Eq.A21)}$$

$$PE_{s,t} = PL_{s,t} \quad \text{(Eq.A22)}$$

$$1/\pi_s * LE_{s,t} = 1/\pi_i * LE_{i,t} \quad \text{(Eq.A23)}$$

$$LT_{s,t} = DE_t - LE_{s,t} \quad \text{(Eq.A24)}$$

$$KT_{s,t} = SK_t \quad \text{(Eq.A25)}$$

$$LT_{i,t} = LE_{s,t} + LE_{i,t} \quad \text{(Eq.A26)}$$

$$KT_{i,t} = IK_t \quad \text{(Eq.A27)}$$

Production sector equations

$$VA_{c,t} = \psi_c * LT_{c,t}^{\varphi_c} * KT_{c,t}^{1-\varphi_c} \quad \text{(Eq.A28)}$$

$$VA_{c,t} * PA_{c,t} * (1 - tp_t) = LT_{c,t} * PL_{c,t} + KT_{c,t} * PK_{c,t} \quad \text{(Eq.A29)}$$

$$TP_t = tp_t * VA_{s,t} * PA_{s,t} + tp_t * VA_{i,t} * PA_{i,t} \quad \text{(Eq.A30)}$$

$$(1 - \varphi_c) * LT_{c,t} * PL_{c,t} = \varphi_c * KT_{c,t} * PK_{c,t} \quad \text{(Eq.A31)}$$

$$IC_{c,t} = IC_{c,s,t} + IC_{c,i,t} \quad \text{(Eq.A32)}$$

$$IC_{c,t} * PC_{c,t} = IC_{c,s,t} * PQ_{s,t} + IC_{c,i,t} * PQ_{i,t} \quad \text{(Eq.A33)}$$

$$1/\omega_s * IC_{c,s,t} = 1/\omega_i * IC_{c,i,t} \quad \text{(Eq.A34)}$$

$$YT_{c,t}^{\theta_p} = \alpha_c^{\theta_p} * \beta_c * VA_{c,t}^{\theta_p} + \alpha_c^{\theta_p} * (1 - \beta_c) * IC_{c,t}^{\theta_p} \quad \text{(Eq.A35)}$$

$$YT_{c,t} * PY_{c,t} = VA_{c,t} * PA_{c,t} + IC_{c,t} * PC_{c,t} \quad \text{(Eq.A36)}$$

$$VA_{c,t} * PA_{c,t}^{\sigma_p} * (1 - \beta_c)^{\sigma_p} = IC_{c,t} * PC_{c,t}^{\sigma_p} * \beta_c^{\sigma_p} \quad \text{(Eq.A37)}$$

Trade sector equations

$$YT_{c,t}^{\theta_x} = \upsilon_c^{\theta_x} * \xi_c * XT_{c,t}^{\theta_x} + \upsilon_c^{\theta_x} * (1 - \xi_c) * DT_{c,t}^{\theta_x} \quad \text{(Eq.A38)}$$

$$YT_{c,t} * PY_{c,t} = DT_{c,t} * PD_{c,t} + XT_{c,t} * PX_{c,t} \quad \text{(Eq.A39)}$$

$$DT_{c,t} * PX_{c,t}^{\sigma_x} * (1 - \xi_c)^{\sigma_x} = XT_{c,t} * PD_{c,t}^{\sigma_x} * \xi_c^{\sigma_x} \quad \text{(Eq.A40)}$$

$$PX_{c,t} = PW_t * ER_t \quad \text{(Eq.A41)}$$

$$QT_{c,t}^{\theta_m} = \nu_c^{\theta_m} * \zeta_c * MT_{c,t}^{\theta_m} + \nu_c^{\theta_m} * (1 - \zeta_c) * DT_{c,t}^{\theta_m} \quad \text{(Eq.A42)}$$

$$QT_{c,t} * PQ_{c,t} * (1 - tq_t) = DT_{c,t} * PD_{c,t} + MT_{c,t} * PM_{c,t} \quad \text{(Eq.A43)}$$

$$TQ_t = tq_t * QT_{s,t} * PQ_{s,t} + tq_t * QT_{i,t} * PQ_{i,t} \quad \text{(Eq.A44)}$$

$$MT_{c,t} * PM_{c,t}^{\sigma_m} * (1 - \zeta_c)^{\sigma_m} = DT_{c,t} * PD_{c,t}^{\sigma_m} * \zeta_c^{\sigma_m} \quad \text{(Eq.A45)}$$

$$PM_{c,t} = PW_t * ER_t * (1 + tm_t) \quad \text{(Eq.A46)}$$

$$TM_t = tm_t * MT_{s,t} * PW_t * ER_t + tm_t * MT_{i,t} * PW_t * ER_t \quad \text{(Eq.A47)}$$

Capital market equations

$$IT_t = IT_{s,t} + IT_{i,t} \quad \text{(Eq.A48)}$$

$$IT_t * IP_t = IT_{s,t} * PQ_{s,t} + IT_{i,t} * PQ_{i,t} \quad \text{(Eq.A49)}$$

$$1/\mu_s * IT_{s,t} = 1/\mu_i * IT_{i,t} \quad \text{(Eq.A50)}$$

$$VT_{c,t} = VN_{c,t}/PQ_{c,t} \quad \text{(Eq.A51)}$$

$$SK_{t+1} = (1 - \delta_s) * SK_t + \Omega_{s,t} * IT_t \quad \text{(Eq.A52)}$$

$$UK_{c,t} = \delta_c * IP_t + \iota_c * IP_t \quad \text{(Eq.A53)}$$

$$IK_{t+1} = (1 - \delta_i) * IK_t + \Omega_{i,t} * IT_t \quad \text{(Eq.A54)}$$

$$RK_{c,t} = PK_{c,t}/UK_{c,t} \quad \text{(Eq.A55)}$$

$$ID_t = ID_{s,t} + ID_{i,t} \quad \text{(Eq.A56)}$$

$$ID_{c,t} = \varepsilon_c * KT_{c,t} * RK_{c,t}^{\sigma_k} \quad \text{(Eq.A57)}$$

$$\Omega_{c,t} = ID_{c,t}/ID_t \quad \text{(Eq.A58)}$$

$$KF_{c,t} = IT_{c,t} + VT_{c,t} \quad \text{(Eq.A59)}$$

Household sector equations

$$LC_{s,t} = DE_t * PE_{s,t} \quad \text{(Eq.A60)}$$

$$ST_{s,t} = o_s * SP_t \quad \text{(Eq.A61)}$$

$$TG_t = tg_t * DE_t * PE_{s,t} + tg_t * IN_t * \Lambda_t \quad \text{(Eq.A62)}$$

$$LC_{e,t} = IN_t * \Lambda_t \quad \text{(Eq.A63)}$$

$$ST_{e,t} = o_e * EP_t \quad \text{(Eq.A64)}$$

$$TF_t = tf_t * DE_t * PE_{s,t} + tf_t * IN_t * \Lambda_t \quad \text{(Eq.A65)}$$

$$LI_{h,t} = LC_{h,t} * (1 - tg_t - tf_t) \quad \text{(Eq.A66)}$$

$$TL_t = TG_t + TF_t \quad \text{(Eq.A67)}$$

$$TC_t = LC_{s,t} + LC_{e,t} + LB_t \quad \text{(Eq.A68)}$$

$$HI_{s,t} = LI_{s,t} + ST_{s,t} + MS_t + HF_t + LB_t + HB_t \quad \text{(Eq.A69)}$$

$$NC_{s,c,t} = \rho_c * SP_t \quad \text{(Eq.A70)}$$

$$HI_{e,t} = LI_{e,t} + ST_{e,t} + AS_t \quad \text{(Eq.A71)}$$

$$NC_{e,c,t} = \rho_c * EP_t \quad \text{(Eq.A72)}$$

$$DI_{h,t} = HI_{h,t} - HS_{h,t} \quad \text{(Eq.A73)}$$

$$SM_{h,t} = NC_{h,s,t} * PQ_{s,t} + NC_{h,i,t} * PQ_{i,t} \quad \text{(Eq.A74)}$$

$$HS_{h,t} = \varsigma_h * HI_{h,t} \quad \text{(Eq.A75)}$$

$$CT_{c,t} = CT_{s,c,t} + CT_{e,c,t} \quad \text{(Eq.A76)}$$

$$CT_{h,c,t} * PQ_{c,t} = NC_{h,c,t} * PQ_{c,t} + \gamma_c * DI_{h,t} - \gamma_c * SM_{h,t} \quad \text{(Eq.A77)}$$

Institution sector equations

$$DS_{c,t} = KT_{c,t} * PK_{c,t} \quad \text{(Eq.A78)}$$

$$DK_{c,t} = \delta_c * DS_{c,t} \quad \text{(Eq.A79)}$$

$$OS_t = DS_{s,t} + DS_{i,t} - DK_{s,t} - DK_{i,t} - MS_t \quad \text{(Eq.A80)}$$

$$TK_t = tk_t * OS_t \quad \text{(Eq.A81)}$$

$$FS_t = OS_t + TF_t + FB_t - TK_t - HF_t - GF_t \quad \text{(Eq.A82)}$$

$$TB_{c,t} = XT_{c,t} * PX_{c,t} - MT_{c,t} * PM_{c,t} \quad \text{(Eq.A83)}$$

$$CA_t = TB_{s,t} + TB_{i,t} + LB_t + HB_t + FB_t + GB_t \quad \text{(Eq.A84)}$$

$$GT_{c,t} = GN_{c,t}/PQ_{c,t} \quad \text{(Eq.A85)}$$

$$GR_t = TG_t + TK_t + TP_t + TQ_t + TM_t + GF_t + GB_t \quad \text{(Eq.A86)}$$

$$GE_t = GN_{s,t} + GN_{i,t} + ST_{s,t} + ST_{e,t} + AS_t + IS_t \quad \text{(Eq.A87)}$$

$$GS_t = GR_t - GE_t \quad \text{(Eq.A88)}$$

$$GD_t = GD_{t-1} - GS_t \quad \text{(Eq.A89)}$$

Market clearing equations

$$QT_t = QT_{s,t} + QT_{i,t} \quad \text{(Eq.A90)}$$

$$QT_t * CP_t = QT_{s,t} * PQ_{s,t} + QT_{i,t} * PQ_{i,t} \quad \text{(Eq.A91)}$$

$$QT_{c,t} = IC_{s,c,t} + IC_{i,c,t} + CT_{s,c,t} + CT_{e,c,t} + GT_{c,t} + IT_{c,t} + VT_{c,t} \quad \text{(Eq.A92)}$$

$$KI_t = KF_{s,t} * PQ_{s,t} + KF_{i,t} * PQ_{i,t} \quad \text{(Eq.A93)}$$

$$KS_t = DK_{s,t} + DK_{i,t} + HS_{s,t} + HS_{e,t} + FS_t + GS_t - CA_t \quad \text{(Eq.A94)}$$

$$DP_t = DP_{s,t} + DP_{i,t} \quad \text{(Eq.A95)}$$

$$DP_{c,t} = CT_{c,t} + GT_{c,t} + IT_{c,t} + VT_{c,t} + XT_{c,t} - MT_{c,t} \quad \text{(Eq.A96)}$$

$$KI_t - KS_t = 0 \quad \text{(Eq.A97)}$$

List of model variables

Labour market variables

AN – Activation workers (Persons, Exogenous)

AS – Activation subventions (Nominal, Endogenous)

ϒ – Activation subventions (Price, Exogenous)

IN – Inclusive employees (Persons, Exogenous)

IS – Inclusive subventions (Nominal, Endogenous)

Λ – Inclusive labour income (Price, Exogenous)

Π – Inclusive subventions (Price, Endogenous)

SP – Standard population (Persons, Exogenous)

NE – National employment (Persons, Endogenous)

Σ – Mobility from activation (Rate, Exogenous)

EP – Excluded population (Persons, Exogenous)

DE – Domestic employment (Persons, Endogenous)

Γ – Mobility from inclusion (Rate, Exogenous)

MB – Migration balance (Persons, Exogenous)

SU – Standard unemployment (Persons, Exogenous)

NU – Total unemployment (Persons, Endogenous)

Ψ – Rate of unemployment (Rate, Endogenous)

SI – Standard inactive persons (Persons, Exogenous)

NI – Total inactive persons (Persons, Endogenous)

Φ – Rate of participation (Rate, Endogenous)

Production sector variables

LT – Total labour factor (Real, Endogenous)

PL – Total labour factor (Price, Endogenous)

LE – Employment inputs (Real, Endogenous)

PE – Employment inputs (Price, Endogenous)

KT – Total capital factor (Real, Endogenous)

PK – Total capital factor (Price, Endogenous)

IC – Intermediate inputs (Real, Endogenous)

PC – Intermediate inputs (Price, Endogenous)

VA – Gross value added (Real, Endogenous)

PA – Gross value added (Price, Endogenous)

TP – Production taxes (Nominal, Endogenous)

YT – Domestic production (Real, Endogenous)

PY – Domestic production (Price, Endogenous)

Trade sector variables

DT – Domestic component (Real, Endogenous)

PD – Domestic component (Price, Endogenous)

XT – Export of commodities (Real, Endogenous)

PX – Export of commodities (Price, Endogenous)

QT – Domestic consumption (Real, Endogenous)

PQ – Domestic consumption (Price, Endogenous)

TQ – Consumption taxes (Nominal, Endogenous)

MT – Import of commodities (Real, Endogenous)

PM – Import of commodities (Price, Endogenous)

TM – Total import taxes (Nominal, Endogenous)

PW – External price index (Price, Exogenous)

ER – Nominal exchange rate (Price, Exogenous)

Capital market variables

IP – Investment price index (Price, Endogenous)

IT – Domestic investment (Real, Endogenous)

VN – Domestic inventories (Nominal, Exogenous)

VT – Domestic inventories (Real, Endogenous)

SK – Standard capital stock (Real, Exogenous)

UK – Capital user costs (Price, Endogenous)

IK – Inclusive capital stock (Real, Exogenous)

RK – Capital return rate (Rate, Endogenous)

ID – Demand for investment (Real, Endogenous)

Ω – Share of investment (Rate, Endogenous)

KF – Gross capital formation (Real, Endogenous)

Household sector variables

LC – Total labour costs (Nominal, Endogenous)

TG – Public labour taxes (Nominal, Endogenous)

ST – Total social transfers (Nominal, Endogenous)

TF – Private labour taxes (Nominal, Endogenous)

LI – Total labour income (Nominal, Endogenous)

TL – Labour income taxes (Nominal, Endogenous)

TC – Total compensations (Nominal, Endogenous)

HI – Households income (Nominal, Endogenous)

NC – Necessary consumption (Real, Endogenous)

MS – Total mixed surplus (Nominal, Exogenous)

HF – Households transfers (Nominal, Exogenous)

DI – Disposable income (Nominal, Endogenous)

SM – Subsistence minimum (Nominal, Endogenous)

LB – Labour cost balance (Nominal, Exogenous)

HB – Households balance (Nominal, Exogenous)

HS – Households savings (Nominal, Endogenous)

CT – Private consumption (Real, Endogenous)

Institution sector variables

DS – Domestic surplus (Nominal, Endogenous)

DK – Capital depreciation (Nominal, Endogenous)

OS – Operating surplus (Nominal, Endogenous)

TK – Total capital taxes (Nominal, Endogenous)

FB – Balance of firms (Nominal, Exogenous)

FS – Savings of firms (Nominal, Endogenous)

TB – Trade balance (Nominal, Endogenous)

CA – Current account (Nominal, Endogenous)

GN – Public consumption (Nominal, Exogenous)

GT – Public consumption (Real, Endogenous)

GF – Government transfers (Nominal, Exogenous)

GR – Public revenues (Nominal, Endogenous)

GB – Government balance (Nominal, Exogenous)

GE – Public expenditures (Nominal, Endogenous)

GS – Government savings (Nominal, Endogenous)

GD – Public sector debt (Nominal, Endogenous)

Market clearing variables

CP – Consumer price index (Price, Exogenous)

KI – Investment of capital (Nominal, Endogenous)

KS – Savings of capital (Nominal, Endogenous)

DP – Gross domestic product (Real, Endogenous)

Taxes and contributions

tp – Production taxes (Rate, Exogenous)

tq – Consumption taxes (Rate, Exogenous)

tm – Total import taxes (Rate, Exogenous)

tg – Public labour taxes (Rate, Exogenous)

tf – Private labour taxes (Rate, Exogenous)

tk – Total capital taxes (Rate, Exogenous)