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Misleading perceptions and economic efficiency in a regional system

This paper's innovation is the introduction of a misperception effect to the core-periphery model. Using a theoretical model, we show that the free market will lead to distorted spatial distribution of firms between the core and the periphery when a misperception effect is introduced into the model. Based on a questionnaire, we found that a misperception regarding the quality of the production factor exists in favour of the core compared to the periphery. This misperception is found not only in the eyes of the core with regard to the periphery, but also in the periphery regarding itself. We suggest marketing and empowerment of the periphery as a policy tool to alter these misperceptions.

Key words: perceptions, economic efficiency, location, periphery

1   Introduction

The geographical concentration of firms within a region is an important factor in both a region's economic development and the regional inequality of income distribution. The tendency of spatial concentration has been analysed by many scholars, generally under the global title of the "core-periphery" issue, and more recently under the theme of the "new economic geography" (NEG; see, e.g., Krugman, 1991; Baldwin, 2001; Lanaspa et al., 2001; Hu, 2002). Robert Helsley and William Strange (1990), Masahisa Fujita and Hesham Abdel-Rahman (1993) and Dirk Dohse (1998) refer to market failure in the spatial location of economic activity. This market failure stems from firms' failure to consider positive externalities (the marginal influence on the agglomeration advantage) and negative externalities (the marginal influence on free-market prices), yet these models do not refer to the extra social costs. Richard Baldwin and Philippe Martin (2004) add the effect of capital mobility to Paul Krugman's (1991) model; they find that spatial concentration does occur, but it may be consistent with a process of delocation of firms towards poor regions. Firm location in certain regions mainly depends on the availability of production factors and their quality. Some of the most common factors are the quality of the labour force, the quality of the infrastructure and positive (economics of scale) and negative (prices) agglomeration effects (see Bar-El & Felsenstein 1990; Taylor, 1993; Wong, 1998; Yukichi & Keijiro, 2000; Hodgkinson et al., 2001).

In this paper we add to the NEG models the idea of misperception of the quality of production factors in the peripheral region in relation to the core region. Perceptions are affected only in part by physical reality, and are also based on well-worn prejudices, desires and memories that take shape in the collective memory (Kavaratzis, 2004). We suggest marketing as a policy tool to alter these misperceptions. Actually, marketing regions/cities has become a common policy tool in order to approve the image of a region (Paddison, 1993), thus promoting the economy of the region by attracting new investments to it (Kearns & Philo; 1993; Short et al., 1993). We first developed a simplified model that shows the equilibrium spatial distribution of firms between the core and periphery, and then extended it by adding a perception factor to the analysis (this is based on Miki Malul and Raphael Bar-El's model; see Malul & Bar-El 2009a, 2009b). After describing the theoretical model, we present an empirical analysis of the perception factors collected from a questionnaire given to the participants.

2   The basic model

The basis for our analysis is the model developed by Malul and Bar-El (2009a, 2009b). We first describe the main principles of this model and then we add the perception effect to the model. For the sake of simplification, we assume that there are only two regions in the economy. A is a core region (a region with a high level of economic activity) and B is a peripheral region. The number of firms actually stands for the level of economic activity. At the starting point, the number of firms in region A is higher than in region B. We assume a perfectly competitive market in which each firm considers both region A and B for its location. The firm's objective when making a decision to locate in region A or B is to maximise the Net Present Value (NPV_j), which the firm sees under free market conditions, taking into consideration all the private benefits versus all the private costs. For analytical purposes, let us make the simplistic assumption that the NPV can be disaggregated into two parts: one part is determined by the specific technological factors of the firm or the sector, and the other part depends on location factors. Let NPV_{basic} represent that part of the NPV that is determined by the specific characteristics of the firm or the sector, such as production technology, production factors, and so on. Now, let $\sum_{i=1} NPV_j(X_{ji})$ represent the other part of the NPV, which depends on location factors. It actually represents that part of the NPV that is attributable to regional factors, where X_{ji} represents variables that affect the NPV and whose values are different in each region, such as prices, agglomeration, infrastructures and so on; i represents the index for each variable, $I = 1 \ldots t$, and j represents the region index $j = \{A,B\}$. Therefore,

$$NPV_j^{private} = NPV_{basic} + \sum_{i=1}^{t} NPV_j(X_{ji}).$$

For the sake of simplification, let us define W_i as the relative weight of influence of variable X_{ji}.

Given that NPV_{basic} is identical for both regions, the firm aspires to maximise the following expression:

$$ZP_j = \sum_{i=1}^{t} NPV_j(X_{ji}) = \sum_{i=1}^{t} W_i X_{ji},$$

where ZP_j is the "private score" of region j and reflects the contribution of the characteristics of region j to the NPV of any given firm in the region – that is, as perceived by the investors that have to make a location decision based on factors such as the influence of infrastructures in the region, the availability of a labour force, the distance from other regions, the cost of land and so on. The "private score" of region j therefore represents the economic benefits that can be gained by the firm as a consequence of the specific qualities of this region.

We normalise the value of each X_{ji} in region B to 1, so that the value of the variable in region A reflects the relative advantage of region A for each of the variables. We have selected five main factors that influence the score ZP_j and divided them

into two groups: exogenous and endogenous. The exogenous factors are represented by variables that are assumed to be determined or at least heavily influenced by forces that are external to a free market, mainly those of public policy such as infrastructure quality, labour force quality and accessibility to central amenities. The endogenous factors are represented by variables that are determined for each region as a function of the number of firms in the region: agglomeration economies (PE) and prices of production factors (PP). Agglomeration economies (PE): it is assumed that an increase in the number of firms in a region increases agglomeration economies and as a result boosts the productivity of each firm in the region (see Arnott, 1979; Henderson, 1983, 1986; Goldstein & Gronberg, 1986; Davis & Weinstein, 1999).

We define y as the ratio n_A/n_B, where n_A and n_B reflect the number of firms in regions A and B, respectively (as defined above, $n_A > n_B$). We also assume that the contribution of agglomeration economies increases at a decreasing rate, as represented by the function:

$$PE_A = (y)^{\alpha}, \ 0 < \alpha < 1$$

where PE_A indicates the relative advantage of region A in relation to region B resulting from the positive effects of agglomeration.

Prices of production factors (PP): as the number of firms in the region rises, the prices (rents, monthly wages and prices of other production factors) in the region rise (see Mera 1973; Mitra 1999; Verhoef 2000). We assume that prices increase at an increasing rate, as represented by the following function:

$$PP_A = (y)^{\beta^p}, \ \beta^p > 1$$

where β^p is the elasticity of prices in relation to the number of firms, defined as the percent change in price in relation to the percent change in the number of firms. Here the PP_A stands for the relative prices in region A as compared to region B.

2.1 The market solution

We have shown that in a system with two regions, A and B, a free market leads to a finite ratio y. The score under free-market conditions is defined for each region as:

Region A: $ZP_A = const_A = W_{PE}y^{\alpha} - W_{pp}y^{\beta^p}$
Region B: $ZP_B = const_B = W_{PE}1^{\alpha} - W_{pp}1^{\beta^p}$,

where $const_j$ is determined by all exogenous variables (infrastructure quality, labour force quality and accessibility to central amenities) and it stands for the relative advantage

of region A as compared to region B. W_{PE} and W_{PP} are the weights of the two parts in the NPV function (PE and PP).

Under free and competitive market conditions, the proportion between the number of firms in Region A and in Region B reaches equilibrium at y_p, as can be seen in Figure 1. This ratio represents a stable system equilibrium (every shift from it will create an advantage for one of the regions, so that the firms will change their location towards equilibrium). The gap between the regions as represented by y_p is a result of free-market consideration when the firms consider the real attributes of each region (i.e., quality of labour force and quality of infrastructure(. In Malul and Bar-El (2009a) this equilibrium y_p was analysed compared to the optimal ratio from a social point of view, where they added other factors such as congestion, pollution and so on to the consideration of the real prices that stem from location in a certain region. They found that the optimal ratio should be lower than y_p, and thus a market failure exists in the spatial distribution of firms. Malul and Bar-El (2009b) extended this model by adding a mobility of production factors between the regions. They found that reducing the mobility costs between the regions does not necessary solve the market failure that stems from the free market; however, it might decrease the inequality in income (GNP) between the regions. In this paper we analyse the free-market equilibrium compared to the equilibrium achieved when an erroneous perception about the scores of the regions is considered by firms.

2.2 The perception effect

We assume that perceptions of the gaps between the constants of the two regions are higher than the real gap between the regions (specifically, that the perception of the constant is combined from the perception of the gap in the quality of the infrastructure, the labour-force quality and accessibility to core amenities). Thus, if the perceptions are different than what is found in the real-life situation, the modified relative score of the core region will be higher than the one that should be and was presented in the previous section.

The new scores of the two regions are:

Region A: $ZP_A = \delta * const_A = W_{PE}y^{\alpha} - W_{pp}y^{\beta^p}$
Region B: $ZP_B = const_B = W_{PE}1^{\alpha} - W_{pp}1^{\beta^p}$,

where δ reflects the perception factor and is larger than 1, saying that the perception is distorting the advantages toward the central region. Actually, for the previous private-market solution this equation holds: $ZPP_A(y_p) > ZP_A(y_p) = ZP_B(y_p)$.

As illustrated in Figure 1, the new free-market equilibrium is $y_{pp} > y_p$ and implies that the free market failed to achieve an
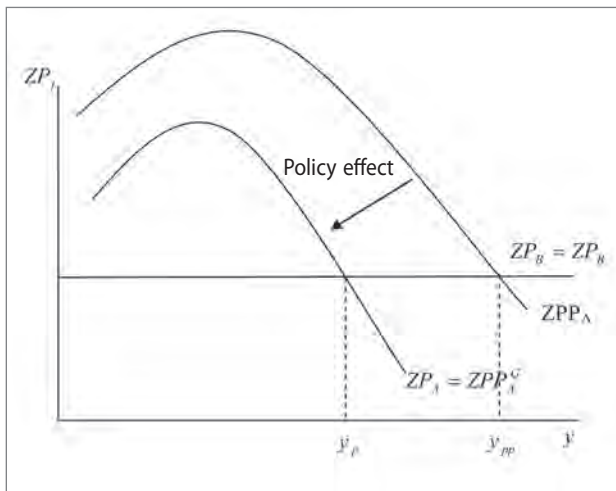
Figure 1: Perception and its impact upon private-market equilibrium and social optimum (illustration: Miki Malul, Mosi Rosenboim and Tal Shavit).

efficient spatial distribution of firms between the core and the periphery due to misperception of the "constant" in the core in relation to the periphery.

In the theoretical model we assumed that a misperception of the core region occurred in relation to the peripheral region when considering the quality of the production factor. The next section describes a questionnaire we administered in order to estimate the scope of this misperception.

3   Empirical estimation

In this section we try to estimate the parameter δ, which measures the differences between the real and perceived gap in the "constants" of each of the two regions. The "constant" mainly includes two factors: the quality of the labour force and the quality of infrastructure, which together constitute about 70% of the "constant" (Malul & Bar-El, 2009a). The other 30% is the business environment, including the general business environment, access to capital and crime levels (Israeli Ministry of Industry, Trade and Labor, 2005).

3.1   The questionnaire

The participants comprised 84 Israeli MBA students: 47 students (average age = 29.85) living and studying (at the College of Management) in the centre of Israel, and 37 students (average age = 30.16) living and studying (at Ben-Gurion University) in the south of Israel. Due to the fact that some of the MBA students that participated in our sample are currently in managerial positions and others might obtain similar positions in the future, there is no reason to assume that using a different sample of managers would yield other results. The central region is the core region (region A in the theoretical model) and

the southern region is the peripheral region (region B in the theoretical model). The participants were asked to complete a questionnaire that included five parts. The participants were told that the questionnaire was anonymous and for research purposes only, but they were not informed of the purpose of the research or the hypotheses that were being tested.

In the first part of the questionnaire, the participants were asked to answer a number of demographic questions, such as age and gender. In the second part we gave the participants the Israeli average value of three measurable indicators – average salary, average years of studies and average crimes per 1,000 residents – and then asked them to estimate the regional value for each indicator. In the third part we asked the participants to scale the production-factor qualities, infrastructure (roads and communication), labour-force quality (labour force and education) and business environment (personal security and general human resources quality). In the fourth part of the questionnaire we evaluated the level of trust. Each participant was asked to rank on a scale of 1 to 7 his or her degree of trust in each of the following two populations: residents of the centre of the country and residents of the south (1 = very low trust, 7 = very high trust). In this section we also asked the subject to bid the maximum amount he or she would be willing to pay for two lotteries that give a 50% probability of winning 1,000 New Israeli Shekels (NIS) or 0 NIS.[1] In each lottery the participant faced one of two payers of the lottery's outcome: either a resident of the centre or a resident of the south.

In the last part we evaluated the subjective time discount rate that each group faced. The basic economic theory concerning time discounting assumes that a subject facing the decision to postpone receipt of payment takes into consideration the time preferences of the payer but not his or her trust in the payer. However, Stephen Knack and Philip Keefer (1997: 1252) suggest that "economic activities that require some agents to rely on the future actions of others are accomplished at lower cost in a higher trust environment". They found that trust has a significant impact on aggregate economic activity.

The participants were asked to state the amount (in NIS) they would be willing to accept (WTA) 24 months from today in order to postpone receipt of a fixed sum of 1,000 NIS they could receive today. In the first question the future payer would be a resident of the south, and in the second question the future payer would be a resident of the centre. According to the implicit risk hypothesis (Benzion et al. 1989), delayed consequences are associated with an implicit risk value, and individuals require compensation for a change in their financial position. According to Mary Stevenson (1986), Leonard Green and Joel Myerson (1996) and Myerson et al. (2003),

delaying rewards is risky because this increases the possibility that something will prevent payment. Gideon Keren and Peter Roelofsma (1995) suggested that discounting occurs due to the uncertainty encapsulated in future payoffs. Specifically, they found that introducing external uncertainty has a similar effect on subject behaviour as did the effect of expanding time delays. In addition, Malul et al. (2010) found that there is a negative correlation between trust level and discount rate for postponed receipt.

4   Results

Analysis of the experimental results indicates that there are misperceptions concerning the southern and centre regions. These misperceptions found expression in all the parameters that were tested in the experiment.

In the second part we used real measurable parameters for the quality of the labour force (monthly wage and years of schooling) and the business environment (crime per 1,000 residents). The participants received the nationally average parameter value and were asked to estimate the regional value. The results indicate that, on average, the participants' estimation for the centre is better than in the real world and the estimation for the parameter of the south (periphery) worse than in the real world. Most of these results (as shown in Table 1) are significant at the 5% level for a *t*-test of the null hypothesis that the average perception equals the real-world value. For example, whereas the real average monthly˝wage in the south was NIS 6,749, the perceived monthly wage is NIS 5,708 according to the southern participants and NIS 5,936 according

to the centre participants. The real monthly wage in the centre was NIS 8,734, according to the southern participants the perceived monthly wage was NIS 9,100 and according to the centre participants the monthly wage was NIS 9,441 Similarly, the results in Table 1 indicate that there are also misperceptions about the years of schooling (indicator for labour quality), and the crime level (indicator for the business environment).

We expected that each group would assess itself as better than what was found in the real world. The results presented in Table 1 indicate that, for all the measurable parameters, the southern participants evaluated themselves worse than the real-world indicator, whereas the centre participants ranked themselves better than what was found in the real world. These results may indicate that perception by the participants in the southern region regarding their abilities and qualities were under-perceived. If the workers in a firm do not believe in their products, then why should the consumers believe in the company's products?

In the third part we asked the participants to scale the production-factor qualities, infrastructure (roads and communication), labour force quality (labour force and education) and business environment (personal security and general quality of business environment). We found that the perception by the participants from the centre of the factors in the south was significantly (except for road infrastructure) worse than the perceptions of the participants from the south (perception of themselves). We found no significant differences between the perception of the factors in the centre region by participants from the centre and the south (see Table 2). The *t*-value (Sig.)

Table 1: Production factors: Real vs. perceived values

Parameter	Evaluator group	Average perception of south (std)	Average perception of centre (std)
Monthly wage	South	NIS 5,708*	NIS 9,100
		(NIS 1,043)	(NIS 1,386)
	Centre	NIS 5,936*	NIS 9,441*
		(NIS 1,156)	(NIS 1,553)
	Real-world value	NIS 6,749	NIS 8,734
Years of schooling	South	12.05*	18.68*
		(1.63)	(1.62)
	Centre	11.62*	15.02*
		(1.45)	(1.26)
	Real-world value	13.30	14.30
Crime	South	64.9	55.2*
		(31.6)	(20.6)
	Centre	76.4*	56.7*
		(49.6)	(18.9)
	Real-world value	61	68

Note: (*) Significant at the 5% level for a *t*-test of the null hypothesis that average perception equals real-world value.

Table 2: Production factor scaling

Parameter	Evaluator group	Average perception of south (std)	Average perception of centre (std)
Road infrastructure	South	3.73	5.05
		(1.02)	(1.25)
	Centre	3.55	5.02
		(1.21)	(1.24)
	t-value (Sig.)	0.72	0.12
		(0.47)	(0.91)
Communication infrastructure	South	5.05	5.73
		(1.13)	(0.99)
	Centre	4.57	5.94
		(1.28)	(0.99)
	t-value (Sig.)	1.82	−0.95
		(0.07)	(0.35)
General labour-force quality	South	4.62	5.78
		(1.21)	(1.15)
	Centre	4.11	5.85
		(1.07)	(0.81)
	t-value (Sig.)	2.04	−0.31
		(0.05)	(0.76)
Education	South	4.35	5.76
		(1.42)	(1.21)
	Centre	3.66	5.43
		(1.31)	(1.12)
	t-value (Sig.)	2.30	1.29
		(0.02)	(0.20)
Personal safety	South	4.41	5.22
		(1.36)	(1.13)
	Centre	3.87	5.19
		(1.54)	(1.11)
	t-value (Sig.)	1.68	0.1
		(0.10)	(0.92)
General human-resources quality	South	4.68	5.51
		(1.20)	(0.84)
	Centre	4.06	5.66
		(1.15)	(0.79)
	t-value (Sig.)	2.36	−0.81
		(0.02)	(0.42)

is for the *t*-test of the null hypothesis that the estimation of the factor is not different between the participants from the south and participants from the centre.

Tables 1 and 2 indicate that the participants underestimate the quality of the production factors in the periphery region and overestimate the quality of the production factors in the centre ($\delta > 1$). The reason for this is not just an underestimation from the centre to the south, but also an underestimation of themselves by the southern participants.

In the last part we analysed the level of trust of the participants from the centre and the south in the population in the centre and the south. The trust was measured by a direct scale concerning the level of trust in each group and by their willingness to pay for the lottery.

Table 3: Average trust level indicators

Parameter	Evaluator group	Average perception of south (std)	Average perception of centre (std)	t-value (Sig.)
Trust scale	South	4.53	4.30	1.16
		(1.25)	(1.24)	(0.25)
	Centre	3.96	4.66	4.22
		(1.18)	(0.96)	(0.00)
Lottery	South	174	167	−0.75
		(180)	(172)	(0.46)
	Centre	173	177	1.76
		(190)	(188)	(0.08)

In Table 3 we present the average trust the residents from each region had in residents of centre and in residents of the south. It seems that participants from the centre have lower trust in people from the south in relation to their trust in people from the centre; however, participants from the south have the same trust in the two groups. The average bidding price for the lotteries reveals that participants from the centre are willing to pay a lower price for the lottery if the payer is a resident of the south. The participants from the south are willing to pay the same price for the lottery if the payer is from the south or from the centre. This is consistent with the trust level because lower trust in the lottery's payer should lead to lower willingness to pay for this lottery.

The mistrust could lead to higher interest rates for the mistrusted group, and subsequently a distorted allocation of capital (Malul et al., 2010). Because the majority of the capital is concentrated in the core region, this might have a negative effect on the business environment in the periphery. We asked the participants to state the average monthly rate of return that they required for postponing receipt of payment for 24 months. As mentioned previously, the participants were asked to state the amount (in NIS) they would be willing to accept (WTA) 24 months from today in order to postpone receipt of a fixed sum of NIS 1,000 they could receive today. In the first question the future payer would be a resident of the south and in the second question the future payer would be a resident of the centre.

For each participant we calculated the monthly interest rate he or she asked for the payment postponement as follows: Assume WTA is the amount that participant i is willing to accept from the future payer 24 months from today in order to postpone the NIS 1,000 he or she was supposed to receive today. The average monthly return (r) is: $r = (\text{WTA}/1{,}000)^{(1/24)} - 1$. The participants from the centre asked on average for a 5.1% monthly return from a southern future payer and 4.8% from a future payer from the centre. Consistent with the perception differences and trust differ-

ences, we find that the monthly return required from the southern payer is higher than the monthly return required from the payer from the centre (t-value = 1.89, Sig. = 0.065).

5 Policy implication

The market failure stemming from the misperception of the "constant" by the firms (as reflected in the experimental results) calls for policy intervention. The central government should "fix" the misperception effect mainly by marketing the periphery region by providing information regarding the current level of infrastructure and labour-force quality in relation to the central region (Kotler et al., 1993; Van der Berg & Braun 1999). These marketing efforts should make the firms/entrepreneurs see the real gap between the amenities in the regions so that the perception distortion is eliminated. Due to the fact that misperceptions lead to a distortion in the allocation of economic activity, from a purely economic point of view, the central government should act in order to achieve efficiency in the economy. In practice, however, the central government should collaborate (or consult) with the regional governments of peripheral communities in order to effectively "fix" the effect of these misperceptions. The policy measures should enable the firms/entrepreneurs to see the score ZP_A in the private market, thus leading to efficient allocation of the economic activity. Actually, the marketing efforts should discount the constant of region A seen by the firms/entrepreneurs in the free market by the ratio $1/\delta$, thus eliminating this distorting effect. This should be done concurrently with changing the infrastructure and labour-force quality so that, finally, $ZPP_A^G = ZP_A$, where ZPP_A^G represents the private score of region A after government intervention. Thus, after the government intervention an efficient distribution of firms between the core and the periphery can be achieved. It is possible that the cost of achieving the efficient equilibrium (y_p) will be relatively high compared to its efficiency. Therefore, the government should consider steering the economy toward y^* where: $y_p < y^* < y_{pp}$.

6 Conclusion

The new economic geography analyses the equilibrium spatial distribution of economic activity between core and periphery while considering economy and diseconomy of scale. Our questionnaire analysis shows that there is misperception in all of the parameters tested. The misperceptions regarding the quality of the labour force (monthly wage and years of schooling), quality of infrastructure (roads and communication) and the business environment (general level of human resources quality, crime level and level of trust), which favoured the centre compared to the periphery, stem not just from an underestimation of the periphery but also a self-underestimation by the southern participants themselves. We showed that the gap between the perceptions, which affect financial decisions such as interest rates and willingness to pay for risky assets, depends on whether the payer is from the south or from the centre. The questionnaire's results validate the necessity of including the misperception effect in core-periphery models.

In our theoretical model we showed that, when a misperception regarding the relative quality of the production factors between a core and peripheral regions exists, the free market fails to achieve an optimal allocation of the economic activity between the core and the periphery. Thus, a policy intervention is required in order to "fix" the distortion created by the misperception effect. The main policy measure that should be taken is marketing of the peripheral region (and also empowerment of the southern population) in order to allow potential investors to perceive the real attributes of this region in relation to the central region. This kind of policy might be helpful in increasing the total welfare of the economy through improved allocation of economic activity between the core and the periphery.

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Notes

[1] The exchange rate was approximately NIS 4 to USD 1 at the time of the questionnaire.

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